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ALBERTA IRRIGATION STUDIES-1966

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AN ANALYSIS OF THE STRUCTURE OF IRRIGATION ADMINISTRATIONS IN SOUTHERN ALBERTA

G.B. PARLBY
AGRICULTURAL ECONOMICS DIVISION

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AN ANALYSIS OF THE STRUCTURE OF IRRIGATION ADMINISTRATIONS IN SOUTHERN ALBERTA

1966

G. B. Parlby

Alberta Department of Agriculture
Agricultural Economics Division
10405 - 100 Avenue
Edmonton, Alberta.

FOREWORD

The administration of irrigation districts in Alberta has a varied and complex history. Individuals, private firms, water users, associations, provincial government and federal government have all participated in the development of our irrigation. Changing economic and social circumstances have created pressures for adjustment in irrigation programs and related administrations from time to time. Irrigation district size varies from 200 irrigated acres to almost 200,000 irrigated acres. By 1965 there were fifteen administrations in irrigation. These varied from independent local farmer trustee boards to official government trustees and provincially or federally appointed managers.

This is a report resulting from a study undertaken in April 1965 by G.B. Parlby of this Division at the request of the Provincial Irrigation Policy Advisory Committee. The purpose of the project was to study the various administrative structures which exist, analyze the related problems and to recommend necessary steps to facilitate improvement in irrigation district administration. The study results should be a useful companion to engineering and economic studies recently completed by other government and university groups.

The co-operation of all irrigation district boards, advisors, managers and employees is appreciated. Although the study was designed to primarily assist the Policy Advisory Committee in its role, we hope that the contents of this report will be useful to all persons involved in administration of irrigation projects in Alberta.

Dr. G.R. Purnell, Director,
Agricultural Economics Division,
Alberta Department of Agriculture.

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ACKNOWLEDGEMENTS

Special thanks must be expressed to the employees and managers of all the Irrigation Administrations for their help, consultation and encouragement. In particular, thanks are expressed to Mr. R.T. White, General Manager of the Eastern Irrigation District, Mr. J. Graham and Mr. A. Rae of the St. Mary and Milk Rivers Development, and Mr. Ken Anderson of the Taber Irrigation District, who gave so willingly of their time and knowledge to provide information for the study.

Thanks must be expressed too, to the staff of the Water Resources Branch and the Colonization Branch for their help and encouragement, both in a technical and advisory capacity.

There is another group, who are seldom acknowledged but who do a great deal of work in making a study a success. These are the secretaries of our own Division. In particular I should mention Mrs. G. Haug and Mrs. R. Bohush.

The results and conclusions are my own responsibility.

SUMMARY OF RECOMMENDATIONS

- The controlling authority of an administration should correspond in principle to an irrigation system.

- A Board of Trustees should be the basic policy making unit.

- The basic managerial unit should be a manager who has been delegated the authority and responsibility to carry out the policies of the Board.

- The management of any system should be free to develop and equate their labor supplies to their own conditions.

- The difference between line authority and staff authority should be recognized in principle in establishing irrigation administrations.

- The joint use of contracted or hired services by all administrations should be encouraged and made available to all that have need for it.

- Accounting procedures should be standardized.

- Consolidation of legislation on all irrigation acts is needed.

- There should be one designated provincial body through which all problems of administrations can be channeled.

- Consideration should be given to continuing study and research to develop new technology.

ABBREVIATIONS

E.I.D.	-	Eastern Irrigation District
W.I.D.	-	Western Irrigation District
B.R.D.	-	Bow River Development (West Block)
P.F.R.A.	-	Prairie Farm Rehabilitation Administration
B.R.P.	-	Bow River Project (P.F.R.A.)
S.M.R.D.	-	St. Mary and Milk Rivers Development (Eastern and Western Divisions)
T.I.D.	-	Taber Irrigation District
M.I.D.	-	Magrath Irrigation District
R.I.D.	-	Raymond Irrigation District
L.N.I.D.	-	Lethbridge Northern Irrigation District
U.I.D.	-	United Irrigation District
M.V.I.D.	-	Mountain View Irrigation District
L.I.D.	-	Leavitt Irrigation District
A.I.D.	-	Aetna Irrigation District
C.P.R.	-	Canadian Pacific Railway
A.R.I.	-	Alberta Railway and Irrigation Company
C.L.I.	-	Canada Land and Irrigation Company

TABLE OF CONTENTS

Page

Section I - DETERMINANTS OF PRESENT FORMS OF ADMINISTRATION .... 1 - 9

Project Development; Legislation and Capital Ownership; Multiple Administrations on Single Systems.

Section II - FUNCTIONAL RELATIONSHIPS .... 10 - 16

Section III - ORGANIZATIONAL RELATIONSHIPS .... 17 - 49

The Policy Making Level; The Managerial Level; The Supervisory Level; The Employee Level; Organizational Charts; Measurements of Administrative Units in Irrigation Organizations.

Section IV - THE RELATIONSHIP BETWEEN CAPITAL OWNERSHIP, STRUCTURE, SIZE AND ECONOMIC EFFICIENCY .... 50 - 58

Section V - APPARENT PROBLEMS IN ADMINISTRATION .... 59 - 72

Level of Service; Comparison Between Administrations; Capital; Provincial Legislation and Organization; Labor Use and Employment; Collections; Water Rights.

Section VI - CONCLUSIONS AND RECOMMENDATIONS .... 73 - 78

Size of Controlling Authority; Structure of Administration; Line and Staff Organization; Contracted or Hired Services; Legislation; Provincial Co-ordination; Future Research.

INTRODUCTION

Administration, in its narrowest sense, is the execution of some desired goal or policy. In its broadest sense, administration covers a whole spectrum of actions, from formulation of policy through its execution to its completion. Policy, whether in private enterprise or government, has its roots in social, economic and legal ground. Administration, because of its intimate association with policy, has similar roots.

In most cases, administration requires group action. In doing so, three main divisions of action become apparent. These are the delegation of authority, the acceptance of responsibility and the need for accountability. Their recognition is a step towards the success of any venture.

The structure or form of administration of any group may be influenced by historical inception, legal framework, desired objectives, goods or services produced, physical location, financial status and present economic conditions. Investigation, into all these areas, is necessary to discover the reasons for the existence of any structure.

Administrators recognize flexibility as an admirable quality. Thus, given a changing environment, a logical expectation would be changing forms of administration. Though change and variety are an ever present condition in administration, stratification is necessary. Private enterprise administrations are found in their legal forms of individual proprietorship, partnership and corporation. Government administrations are municipal, provincial or federal in nature. A third stratum exists. These are government proprietorships. Their objectives, formation and action are similar to those of private enterprise, except that a service motive is substituted for a profit motive. These administrations own and use resources; have considerable autonomy; charge for their services and are usually accountable to a board. The board's function is similar to that of a board of directors, who formulate policy for a corporation. A fourth group of administrations exist in law for social or benevolent purposes. These include associations, charities and the like.

It is government proprietorship that concerns this study. Irrigation administrations, along with such government services as utilities, telephones and

transportation, fall into this classification. Special characteristics of irrigation administrations include the power of a captive market. Once an administration has been formed, everyone, who is eligible, must buy the services regardless of their utility. Another special characteristic, is the flexibility with which an administration can change its boundaries. This attribute is not available to its municipal cousin.

In Southern Alberta, there are fifteen major administrations serving water users through seven irrigation systems.[1] In this study, the procedure used was to make a case study of the Eastern Irrigation District, the St. Mary and Milk Rivers Development, the Taber Irrigation District, and the Lethbridge Northern Irrigation District. Short visits or requests by mail were made to other administrations. These included the Western Irrigation District, the Bow River Development, the P.F.R.A. Bow River Project, the P.F.R.A. St. Mary Project, the United Irrigation District, the Raymond Irrigation District, the Magrath Irrigation District, the Mountainview Irrigation District, the Leavitt Irrigation District, the Aetna Irrigation District and the Water Resources Section of the Leavitt, Aetna and Mountainview System.

The objectives of this study were to:

(a) Collect information on the structure of each of the irrigation administrations.

(b) Analyze this information on a comparative basis to find out similarities or differences in structure.

(c) Determine reasons for these.

(d) Provide information from other areas where applicable.

(e) Develop bench marks and guide lines on the kind of structure required for an irrigation administration.

The following assumptions were made:

(a) The best sources of information would be the administrators of irrigation districts, developments and projects. These are the people who put policy into action; the people who have an intimate knowledge of their administrations. The principles of flight were learned from observing the creatures

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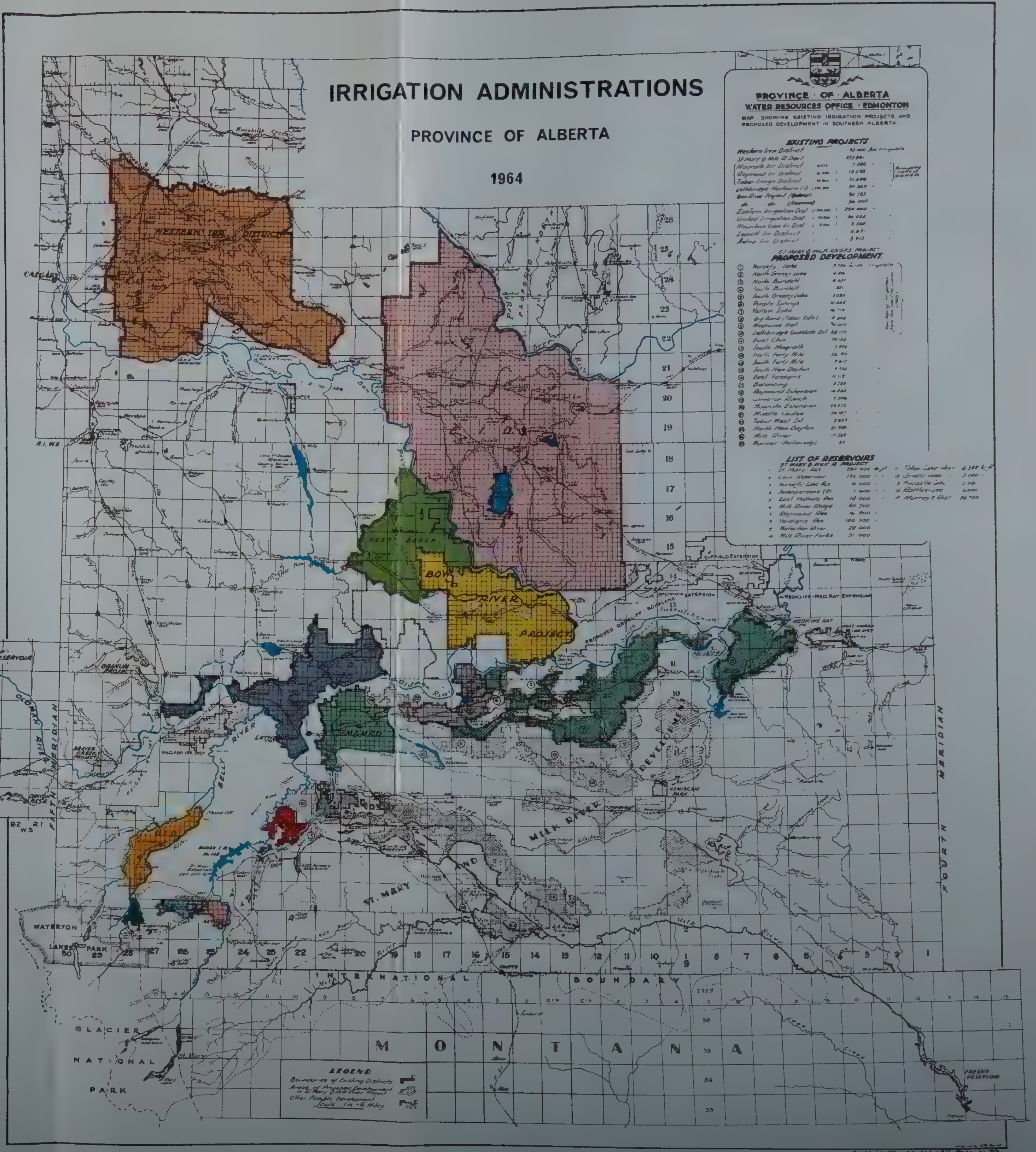
[1] An irrigation system is an inclusive term to cover all works from the point of diversion on a river to the farmers land, until the excess is drained back to the river.


IRRIGATION ADMINISTRATIONS
PROVINCE OF ALBERTA
1964
PROVINCE · OF · ALBERTA
WATER RESOURCES OFFICE · EDMONTON
MAP SHOWING EXISTING IRRIGATION PROJECTS, AND PROPOSED DEVELOPMENT IN SOUTHERN ALBERTA.
EXISTING PROJECTS
Western Irrn District 50 000 Acs Irrigable
St Mary & Milk R Dev't
Magrath Irr District 7 000
Raymond Irr District 19 050
Taber Irrign District 31 400
Lethbridge Northern I.D.
Bow River Project
Eastern Irrigation Dist 250 000
United Irrigation Dist
Mountain View Irr Dist
Leavitt Irr District
Aetna Irr District
ST MARY & MILK RIVERS PROJECT
PROPOSED DEVELOPMENT
Horsefly Lake
North Grassy Lake
North Burdett
South Burdett
South Grassy Lake
Purple Springs
Yellow Lake
Big Bend (Taber Extn)
Medicine Hat
Lethbridge Coaldale Ext
East Chin
South Magrath
North Forty Mile
South Forty Mile
South New Dayton
East Verdigris
Balancing
Raymond Extension
Cameron Ranch
Magrath Extension
Middle Coulee
Taber West Ext
North New Dayton
Milk River
Warner (Portion only)
LIST OF RESERVOIRS
ST MARY & MILK R PROJECT
St Mary Res 290 000
Chin Reservoir 150 000
Horsefly Lake Res 6 000
Sevenpersons (2) 1 600
East Pothole Res 18 000
Milk River Ridge 80 700
Raymond Res 16 900
Verdigris Res 140 500
Waterton River 28 000
Milk River Forks 31 000
Taber Lake Resr
Grassy Lake
Forcastle Lake
Rattlesnake
Murray's Resr
WESTERN IRR. DISTRICT
CALGARY
E.I.D.
WEST BLOCK
BOW RIVER PROJECT
L.N.I.D.
ST.M.&M.R.D.
LETHBRIDGE
MACLEOD
CARDSTON
U.I.D.
WATERTON LAKES PARK
SUFFIELD EXTENSION
REDCLIFF-MED. HAT EXTENSION
MEDICINE HAT
PROPOSED REDCLIFF-BOWELAND
DEVELOPMENT
MILK RIVER
ST. MARY AND MILK RIVER
BELLY RIVER
OLDMAN RIVER
FIFTH MERIDIAN
FOURTH MERIDIAN
INTERNATIONAL BOUNDARY
MONTANA
GLACIER NATIONAL PARK
FRESNO RESERVOIR
LEGEND
Boundaries of Existing Districts
Areas of Proposed Development in St Mary & Milk River Project
Other Possible Development
Scale 1 in = 6 Miles

of the air. A falling apple resulted in a law of gravity. Guide lines to irrigation administration can be best developed by discussion with people, who make the daily decisions and perform the daily tasks in moving water from the river to the farm.

(b) Any attempt at providing uniformity in administration, would require changes in present conditions. These conditions, as already stated, include social, economic and physical factors. It is here that the study must concentrate its efforts.

(c) Administration is difficult to measure in terms of quantity. Quality and judgement would remain an important factor in interpretation of statistics.

This report is divided into six sections. They include Determinants of Present Forms of Administration; Functional Relationships; Organizational Relationships; The Relationship Between Capital Ownership, Organization Structure, Size and Economic Efficiency; Apparent Problems in Administration; and Conclusions and Recommendations.

Statistical information is based on knowledge up to January 1st, 1964. With this beginning, the analysis of the structure of irrigation administrations in Southern Alberta proceeds.

SECTION 1

DETERMINANTS OF PRESENT FORMS OF ADMINISTRATION

To find out why various forms of administration exist in irrigation projects,[2] it is necessary to delve into their historical development, their enabling legislation and their ownership of capital.

PROJECT DEVELOPMENT

Perhaps, as in most projects, many factors interlock to bring about irrigation. Most important, although often considered too obvious for mention, is a shortage of rainfall during the cropping season, over a sufficient number of years to create high risk and uncertainty and consequent instability in the agricultural industry. Within the area of the Palliser Triangle[3], this criterion has been satisfied often enough, since Western Canada's settlement to make insurance and stability two of the by-words of proponents of irrigation.

The need for land settlement was a second factor encouraging the establishment of irrigation. The Dominion Government, although not financially involved in constructing projects, provided engineering services, including extensive surveys of lands which could be irrigated by gravity.[4] The Dominion Government, as well, in the interest of land settlement, granted lands to the railways to build rail lines. The C.P.R. built the transcontinental line which joined the Dominion from coast to coast. The Alberta Railway and Coal Company built a line from Dunmore to Lethbridge and Lethbridge to Great Falls. The Alberta Railway and Coal Company, subsequently known as the Alberta Railway and Irrigation Company, was purchased by the Canadian Pacific. The railways were interested in irrigation to raise the value of the lands they had received and to increase the rail traffic by creating a densely populated area not possible under dry land conditions.5/

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[2] Engineers often refer to any specific building of irrigation works as a project. This may or may not be a whole irrigation system, as previously described.

[3] The Palliser Triangle begins on the international boundary at a point just southeast of Brandon, Manitoba, and runs northwest to a point near Vegreville, Alberta, then southwest to Cardston, Alberta. W.L. Foss "An Engineer Looks at Irrigation in Western Canada" Unpublished Manuscript. P.F.R.A. Lethbridge, Alberta.

[4] Harries, H. "The Economic Basis for Past Irrigation Expenditure in Alberta" 1952 H. Harries & Associates, Edmonton, Alberta.

The Canada Land and Irrigation Company and its predecessors, The Robins Irrigation Company, The Southern Alberta Land Company, and the Canadian Wheatland Company were interested in land settlement and irrigation for return on investment. The existence of these companies was made possible by the Northwest Irrigation and the Federal Land Acts. These acts enabled the Companies to purchase land from the Federal Government and apply for the right to divert water.6/

The Railways and the Canada Land and Irrigation Company were part of what various writers have called the "corporation stage" of irrigation development in Alberta.

The next stage in development was the "co-operative stage" where farmers organized irrigation administrations under the Irrigation Districts Act of 1915. The Lethbridge Northern and the United Irrigation Districts required Provincial Government guarantees to obtain financial backing. Taber, Magrath, and Raymond were financed by debentures purchased by the C.P.R.7/

The next major involvement in irrigation development came through government. Alberta and Canada, by mutual agreement, were major forces in development and rehabilitation in the late forties and early fifties. Reasons given for the desirability of constructing the St. Mary and Milk Rivers Development were; the need to keep international water agreements between Canada and the United States; the need for projects to facilitate post-war adjustment, both in

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5/ Harries, H. - See footnote 4/.

6/ Kirk, D.W. - "The Bow River Irrigation Project" Part I, 1955. Prairie Farm Rehabilitation Administration, Regina, Saskatchewan.

7/ Spence, C.C. - "An Administrative Guide to Central Saskatchewan Irrigation Development" (Unpublished) 1962, Economics Division, Canada Department of Agriculture.

employment and settlement; the expressed desire for irrigation by dryland farmers; and the need for more water for existing projects.[8/]

The Bow River Development was the second project in which major Governments were involved. Following a Federal, Provincial and Company agreement, the Dominion Government purchased the headworks and the central block of the Canada Land and Irrigation Company. The Province began development and settlement of the west block, while the Dominion began rehabilitation, extension, and settlement of the central block. Reasons given for development included; the need for lands to resettle farmers from drought stricken areas; the need for improved works on the main canal and the need for irrigation in areas where heavy Prairie Farm Assistance payments had been made.[9/]

Along with the corporate, farmer and government developers, pressure groups have played their part in initiating irrigation. Chambers of Commerce, the Western Canada Irrigation Association and the Irrigation Development Association were among those involved.[10/] Chambers of Commerce have realized development means increased population; an increase in required services; and thus increased business activity for the whole region.

[8/] Meek, V. - "Report of the St. Mary and Milk Rivers Water Development Committee" 1941, Queen's Printer, Ottawa, Canada.

[9/] Kirk, D.W. - See footnote 6/.

[10/] Harries H. - See footnote 4/.

LEGISLATION AND CAPITAL OWNERSHIP

Federal and Provincial legislation set the limits within which local administrations can perform. In Provincial Acts, procedures for formation, financing, construction, operation and dissolution are set forth for most irrigation administrations subject to stipulation, such as the approval or consent of the Minister of Agriculture.

Table I indicates the Acts under which legal authority has been granted to administrations. The Irrigation Districts Act of 1915, with revisions, is the basic Act for most administrations. The other Acts appear to be variations from the original, placing the authority for construction, operation, maintenance or financing in the hands of someone other than a Board of Trustees, as originally conceived. In many cases, such as the E.I.D. and the S.M.R.D., transfers of assets, including lands, required legislative sanction.

The Prairie Farm Rehabilitation has none of the advantages or disadvantages of the Provincial Acts, as being part of Canada's administration they are subject only to Federal Law.[11/]

The Irrigation Districts Act established the Irrigation District as a "quasi - municipal" [12/] administration. This requires the election of a Board of Trustees from bona-fide water users of the district. The Act requires the appointment of a Secretary-Treasurer, a District Manager and/or Engineer at the request of the Irrigation Council, and an Auditor, by the Board of Trustees.

The Eastern and Western Irrigation District Acts, while setting up a Board of Trustees, specifically call for the appointment of a General Manager. The General Manager is made responsible for the operation and maintenance of the districts' works and the hiring of staff. In addition, the General Manager has the powers and duties of the Secretary-Treasurer vested in him.

[11/] Douglas C., Manager P.F.R.A. Bow River Project, Vauxhall, Alberta.

[12/] Hanson W. - Study Committee on Irrigation for the Province of Alberta 1958.

TABLE I

SOURCES OF LEGAL AUTHORITY FOR IRRIGATION ADMINISTRATIONS 1964

Name of Administration	Irrigation Districts Act	Water Resources Act	Other Acts Specified
E.I.D.	x	x	Eastern Irrigation District Act
W.I.D.	x	x	Western Irrigation District Act
U.I.D.	x	x	United Irrigation District Act
L.N.I.D.	x	x	Lethbridge Northern Colonization Act
P.F.R.A.	None	None	Prairie Farm Rehabilitation Act
S.M.R.D.	x	x	St. Mary & Milk Rivers Development Act
T.I.D.	x	x	
R.I.D.	x	x	
M.I.D.	x	x	
B.R.D.	x	x	Bow River Development Act
M.V.I.D.	x	x	
L.I.D.	x	x	
A.I.D.	x	x	

- -

In the Lethbridge Northern and United Irrigation Administrations, established in 1925 and 1935 [13/] respectively, Section 70 of the Irrigation Districts Act has been used to replace the Board of Trustees with an Official Trustee. The main reason for these moves was the same. The districts were unable to meet their debenture payments. Under this form of administration, water user representation has reverted to an advisory capacity.

The two provincial crown corporations, The Bow River Development and St. Mary and Milk River Development, have Managers appointed by the Minister of

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[13/] Spence C.C. - See footnote 7/.

Agriculture. These Managers have corporate status and take on many of the powers, duties and responsibilities of a Board of Trustees under the Irrigation Districts Act. Both Managers have Water User Advisory Committees to advise them. There are two possible reasons for this type of administration. If the administration and its works are in a development stage, a stronger administrative control may be desirable. A second reason may be the desire by the Province to keep a tight rein on the affairs of the development because public funds were used for construction. These same reasons may apply to the two Federal Government administrations.

The foregoing discussion suggests that in irrigation administrations "the agency" which supplied the capital for construction and major rehabilitation has had a large degree of authority, at least at the policy making level. Responsibility to shareholders, water users or the public at large has determined the form of administration. The principle that financial responsibility should determine administrative control has been a consideration where normal investment channels have not been open at reasonable interest rates.

Where water users have either provided the capital or part of it, the form of administration that resulted was a Board of Trustees. Where capital has been relinquished by corporations to water users, a Board of Trustees has again been the result. Where the Provincial Government has assumed financial obligations, Official Trusteeships have resulted. Where development has taken place by government, either Crown Corporations or direct Government administration has been the result. "He who pays the piper, calls the tune."

The effect of capital ownership upon the form of administration is summarized in Table II.

Past ownership refers to the ownership of major sources of capital funds during project construction and early operation. Present ownership refers to the authority presently owning the majority of sunken capital.

TABLE II

THE EFFECT of CAPITAL OWNERSHIP upon the form of ADMINISTRATION

	IRRIGATION DISTRICT	E.I.D.	W.I.D.	U.I.D.	L.N.I.D.	S.M.R.D. P.F.R.A.	S.M.R.D. West	S.M.R.D. East	T.I.D.	R.I.D.	M.I.D.	B.R.D. P.F.R.A.	B.R.D.	M.V.I.D.	L.I.D.	A.I.D.
ADMINISTRATIVE FORM	MANAGER -- P.F.R.A.					■						■				
	MANAGER -- Advisory Committee						■	■					■			
	OFFICIAL TRUSTEESHIP -- Advisory Committee, District Manager, Secretary-Treasurer			■	■											
	BOARD OF TRUSTEES -- Secretary-Treasurer, District Manager								■	■	■			■	■	■
	BOARD OF TRUSTEES -- General Manager	■	■													
PRESENT OWNERSHIP	WATER USERS	■	■	■	■				■	■	■			■	■	■
	ALBERTA			■	■		■	■					■			
	CANADA					■						■				
PAST OWNERSHIP	CANADA LAND & IRRIGATION CO.											■				
	CANADIAN PACIFIC RAILWAY	■	■				■									
	WATER USERS			■	■				■	■	■			■	■	■
	ALBERTA							■					■			
	CANADA					■										

MULTIPLE ADMINISTRATIONS ON SINGLE SYSTEMS

In discussion of the determinants of the forms of administration, no mention has been made of the relationship between the form of administration and the physical works over which it has control. Three instances exist where more than one administration is involved in transportation and distribution of water diverted from the same headgates. This situation has resulted from time lapses between stages of development and consequent changes in interests of the developers and in those supplying the capital.

The St. Mary and Milk Rivers development program was superimposed on an already existing administration, the Lethbridge-Coaldale C.P.R., who supplied the Raymond and Magrath Irrigation Districts with water, and allowed its eastern neighbor, the Taber Irrigation District, to use water from what is now called the Chin Reservoir. As we have seen, the St. Mary and Milk River Development was a joint program between Canada and Alberta. The result has been a division in administration. P.F.R.A. operates the headworks. The S.M.R.D. wholesales to Raymond, Taber, and Magrath; is a semi-retailer to its western division, the old Lethbridge-Coaldale system; and is a retailer to the new development called the eastern division.[14/]

The second multiple administration on a single system is the Federal and Provincial Bow River Project. Originally, one development under the Canada Land and Irrigation Company, the project has split its jurisdiction because of an agreement between Canada and Alberta for joint development. Thus the B.R.D. or West Block purchases water from the federal carrier administered by P.F.R.A. The Central Block, B.R.P., is administered by P.F.R.A. The East Block, across the Bow River is in an undeveloped state.[15/]

The third multiple administration is composed of the Irrigation Districts of Mountain View, Leavitt and Aetna and the Water Resources Branch of the Alberta Department of Agriculture. The Irrigation Districts developed co-operatively with the help of the Water Resources Branch.[16/] Water Resources operates the headgates of the system.

[14/] See "The St. Mary and Milk Rivers Development and the Irrigation Districts of Taber, Raymond, and Magrath." Map Page 49.

[15/] See "Irrigation Administrations in Southern Alberta" Map in Introduction.

[16/] See footnote 15/

All other irrigation systems have a single administrative authority. It is worthy of note that the forms of administration represented include Boards of Trustees, Managers of Crown Corporations and direct government administration by P.F.R.A.

In future discussion of administrative organization it would be well to remember that multiple administrations on single systems are present today more because of historical reasons than any economic basis and that there is no standard form for these multiple administrations.

SECTION 11

FUNCTIONAL RELATIONSHIPS

FUNCTIONS

In Irrigation administrations, the basic objectives, and thus the basic functions are twofold. They are the transportation and distribution of water. These functions have many component parts which may or may not be adopted by an administration depending upon its particular objectives regarding kind and level of service.

Major functions are listed as follows:

- Operation
- Maintenance
- Rehabilitation and Extension
- Supplies, Materials and Equipment Provision
- Accounting
- Lands Management
- Personnel Management
- Public Relations

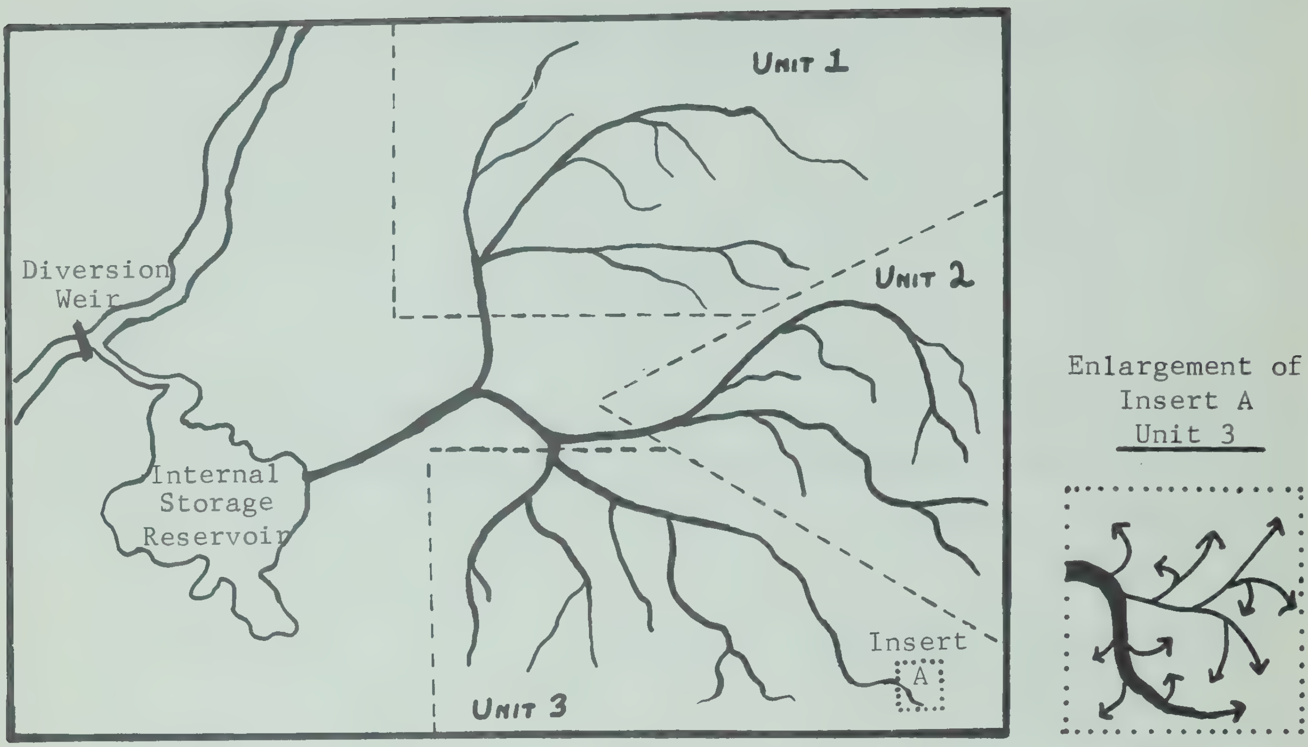
These major functions can be broken down as follows:

Operation includes:

- Ordering
- Diversion
- Storage
- Flow Regulation
- Delivery
- Drainage

These functions can be elaborated to some extent by the use of Diagram I.

DIAGRAM I



As water is required on any quarter of land, in Unit 3, notification for delivery is given to operator[17/] 3, 48 hours ahead of time. The sum total required for Unit 3 is calculated. A similar process is carried on in Units 1 and 2 by their respective operators. Each Unit operator notifies the operator on the reservoir of its requirements. These could be increases or decreases depending upon previous requests. The net increase or decrease in flow for all three Units is tallied and an adjustment made at the reservoir and at each lateral as the flow reaches it. The new flow on each lateral is distributed by a means of checks and turnouts to the quarters of land requiring it. Excess water is drained off through the system's drainage works.

Prior to, or concurrent with this operation, maintenance of the reservoir level can be achieved by adjustments to the Diversion Weir.

[17/] The term operator is used for the sake of generalization. See Section III for description of employee duties including that of Watermaster and Ditchrider.

Maintenance includes:

Inspection
Prevention
Emergency Repair

Maintenance is a continuing function of irrigation administrations. Inspection entails observation of the works of the system, prior to, during and after the irrigation season. Inspection usually parallels the operation function. Prevention includes flushing, drag line work, riprapping, ditch cleaning, small structure replacement and chemical control of weeds, brush and aquatic growth. Emergency repair is carried out on damaged structures and washouts on canal banks. This kind of repair requires a maximum effort for short periods of time.

Rehabilitation and Extension include:

Research
Design
Surveying
Construction

Rehabilitation and extension of the physical works of an irrigation system occur periodically. They are dependent upon the physical life of the works and the demand for more irrigated land. The physical life of a system's major works varies from 50 to 100 years.[18/] With such irregularity of replacement and extension, there may be long periods of time when little research, design, surveying and construction are contemplated. At the same time, research and design of major works are professional functions, requiring the services of trained engineers. Under these circumstances, it is logical to assume that one administration cannot afford to carry staff permanently to fulfill this function. In recent years, this function has been partially or wholly assumed by outside agencies, such as P.F.R.A. and the Water Resources Branch of the Alberta Department of Agriculture.

Surveying and construction have been partly integrated with land surveys

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[18/] "The Annual Cost of the Eastern Irrigation District" - Canada Department of Agriculture, P.F.R.A., Regina 1965.

and maintenance functions in administrations, as the technical means for fall and winter construction become increasingly available. On large projects, such as the east division of the S.M.R.D., construction was accomplished by the letting of private contracts. Rehabilitation and Extension are the first functions of an irrigation administration which have been partially or wholly carried out by contract with outside agencies.

Supplies, Materials and Equipment Provision include:

Ordering
Inventory Control
Distribution

Supplies, materials and equipment are ordered and distributed for operation, maintenance and construction. This function is secondary to all functions previously mentioned. They are enabling functions and are accomplished by having equipment and materials readily available where they are needed. Supplies and materials used by irrigation administrations include such items as chemicals for weed control, cement, rock, gravel, lumber, culverts and steel turnouts. Equipment includes such items as trucks from ½ to 5 tons in size, tractors from D-2 and John Deere Crawlers to D-8's in size, ditchers, dozers, scrapers, back hoes, and drag lines. Whether the provision of machinery and equipment is a function which is accomplished by rental or ownership is an individual policy or management decision. Irrigation administrations presently use both methods.

Accounting includes:

Processing of Financial Transactions
Preparation of Budgets
Keeping of Records
Control of Inventories
Preparation of Financial Statements
Preparation of Progress Reports and Cost Accounts
Assistance to Auditors

The accounting function has both enabling and advisory aspects. The processing of financial transactions includes the preparation of the assessment roll, the granting of water service contracts, billing, collection, enforcement, verification of bills, payment of bills, payroll preparation and the handling of investment and loan transactions. These functions, as well as those of record keeping and inventory control, enable administrations to perform the operation and maintenance functions. Budget preparation, depending upon its specific nature, can be considered both enabling and advisory. The preparation of progress reports, cost accounts and financial statements are advisory functions carried out for managers, policy makers and rate payers.

Business administrations often designate accounting as a staff function. As such, no major delegation of authority for the operation and maintenance functions is required in the performance of accounting duties.

Lands Management includes:

Acquisition of Rights of Way
Acquisition of Easements
Approval of Land Transfers
Purchase and Sale of Lands
Surveys for Changes in Assessment
Assessment of Damage
Negotiation and Operation of Leases
Operation of Farms

Like accounting, lands management is an enabling function. The acquisition of right of way and easement is necessary for construction, and operation of the system. Approval of land transfer prevents excessive installation and maintenance costs. This is achieved by reducing the number of turnouts required per quarter of land. Purchase and sale of lands, and surveys for changes in assessment, are related to rate enforcement and revenue collection. Lands are often purchased to prevent canal filling by soil drifting. These lands are leased to farmers, grazing associations or may be operated by the administration itself. The operation of farms appears to be ancillary to the basic water transportation and distribution functions. Although ownership of land is necessary for control of its use, leasing land to agricultural producers is all that is necessary to accomplish the desired end.

Personnel Management includes:

- Hiring
- Duty Delegation
- Wage Negotiations
- Employee Benefits
- Firing

Of all the functions discussed to date, personnel management can be most critical to the attainment of an administration's objectives. Human relationships cannot be divorced from water transportation and distribution. The more desirable the wage levels, the employee benefits and the division of duties, the more probable it is that there will be excellent service and pride in the administration. Employee benefits include such items as provision of housing, medical services, pensions, holidays and the regulation of working hours.

Public Relations include:

- Inter - Agency Contact
- Dissemination of Information
- Creation of Good-Will

This function, although not as necessary to irrigation administrations as to businesses, could smooth the wheels of operation and maintenance. The lesser necessity is due to the fact that irrigation administrations have a captive market. Inter-agency contact takes place with Federal, Provincial and Municipal governments and private concerns such as oil companies, sugar factories and canning factories. Dissemination of information includes such subject matter as irrigation policy, regulation and procedure. Creation of good-will is desirable at all times especially with rate payers of the system.

Although not explicitly stated in all cases, it is important to note that all the major functions enable the performance of the operation function. It is a matter of degree which establishes their importance. Thus, with the authority for operation of a constructed system comes the necessity to carry out the rest of the functions. This point is critical in discussing size of administration. To avoid duplication of all functions, the operation function or portions thereof need to be sharply delineated. Where this cannot be done, complications in administration are likely to result requiring transfers of money, joint use of staff, agreements on servicing of similar areas, reconciliation of objectives, and joint meetings with outside agencies. Generally, it would appear, that the sharpest delineation of the water transportation and distribution functions appears when the operation function is considered as a whole. From an irrigation administration point of view, this suggests that consideration should be given, where possible, to retaining authority for the operation of a system under one administration. Other interests may require a different division of authority. For instance, control of the river flows between upstream and downstream uses according to the beneficial use priority concept might require that the dams or diversion weirs on the rivers be operated and maintained by a Provincial Authority.

SECTION 111

ORGANIZATIONAL RELATIONSHIPS

In many organizations whether designed for government or business, there are four major administrative levels. These levels are classified on the basis of their responsibility and authority in making decisions. These are the Policy Making level, the Managerial level, the Supervisory level and the Employee level. Irrigation administrations are no exception to this type of organization. In all cases they have some form of policy making body. Combinations of all administrative levels are present where organizational size does not allow for separation of function. Employee roles are present in all cases.

THE POLICY MAKING LEVEL

As discussed in Section I there are at present five forms of administration in Southern Alberta. These forms have been categorized by considering differences in policy making and managerial structure. The five forms are reiterated here to facilitate discussion of the policy making level.

1. Board of Trustees elected by the Water Users; Secretary-Treasurer and District Manager[19/] appointed by the Board of Trustees.
2. Board of Trustees elected by the Water Users; General Manager appointed by the Board.
3. An Official Trustee appointed by the Provincial government; Advisory Committee elected by the Water Users; Secretary-Treasurer and District Manager[20/] appointed by the Official Trustee.
4. A Manager appointed by the Provincial government; Advisory Committee elected by the Water Users.

[19/] The appointment of a District Manager is required by Act only on the direction of the Irrigation Council.

[20/] See footnote 19/.

5. A General Manager appointed by the Federal Government (P.F.R.A.); an Advisory Committee organized under the Societies Act and elected by the Water Users.

The making of policy for these categories is formulated through a similar process. Policy requires first that there be a problem. Externally problems may be raised by the water users of a district, local government, local industry, other irrigation administrations or provincial and federal government. Internally problems may arise through members of staff or management needing directives. Usually in this process either management or the policy making body bring up the problems for joint discussion. In discussion, they work most successfully as team mates.[21] The quantity of discussion and consequent decision on policy by a policy making body is dependent on the degree of delegation of authority and responsibility. Retention of authority and thereby responsibility requires more decision at the policy making level.

Policy formulation in many cases is subject to approval by a Provincial Authority. This may be the Irrigation Council[22], the Minister of Agriculture, a Cabinet Committee on irrigation or an Order in Council of the Provincial Cabinet.

Boards of Trustees are required to meet once a month to decide on matters of concern. Special meetings are held for specific matters. Boards of Trustees have the authority to make policy decisions. Management, in both the case of the Secretary-Treasurer - District Manager combination and the General Manager, advise and discuss policy but do not have the power to make an independent policy decision.

Advisory Committees to Official Trustees, or to Managers of Crown Corporations and P.F.R.A., meet on the request of the Authority in charge. Depending upon the particular administration, the advisory committee may be a sounding board for new ideas, a listening post for problems out in the district or more nearly, a trusteeship making major policy recommendations. Still, in terms of authority, these committees only advise. The policy decision remains the responsibility of the Official Trustee or the Manager.

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[21] Fuller, Dr. J.B. - Address to the Four States Irrigation Council, 1963.

[22] At present the Irrigation Council consists of the Minister of Agriculture and Council Secretary, the Director of Water Resources Branch, of the Alberta Department of Agriculture.

The responsibility for management making policy decisions increases with the degree of authority that management has been given. There appears to be a progression, from Boards of Trustees with a Secretary-Treasurer, to Boards of Trustees with a General Manager[23/], to Official Trustees, to Managers with Advisory Committees in the amount of authority for policy decision making.

The areas where internal policy may be decided upon include the:[24/]

- approval of the budget.
- setting of water rates for irrigation, domestic and industrial use.
- approval and authorization to borrow working capital.
- authorization for tender and purchase of major pieces of equipment.
- setting of regulations regarding water right, water use and kind of service.
- authorization for expenditure on major rehabilitation and extension.
- purchase or disposal of capital items including canal extension on operation or drainage works and sale of telephone assets to Mutual Companies.
- payment on flood damage or seepage claims.
- approval of land transactions.
- investment of capital replacement funds.
- approval of secondary functions such as farm ditching, dugout work, hail insurance and farm operations.
- adoption of employee benefits including housing, medical services, pensions, and working hours.
- approval of wage scales.

The areas where external policy may be decided upon include the:[24/]

- sharing of costs with senior governments e.g. 3-way arrangements on bridges.
- requests for changes in provincial legislation and policy.
- agreement for co-operation on weed control programs with local governments.
- support of joint action by the Irrigation Projects Association.
- approval of agreements with cities and towns for water supply.

[23/] The General Manager position has the right to hire and fire employees and can take disputes with Boards of Trustees on policy to the Irrigation Council for decision.

[24/] A synopsis from the minutes of the policy making bodies of the E.I.D., W.I.D., L.N.I.D., T.I.D., U.I.D. and the S.M.R.D.

- diversion of water from rivers and the purchase of water supplies from wholesalers.
- approval of agreements for development of drainage works with Municipal governments.
- setting of rates for grazing associations.
- support of local district organizations e.g. 4-H.

In a final discussion of the policy making body, a consideration of the advantages and disadvantages of each form of administration may be useful. These will be presented from an administrative point of view. It may be worthwhile to remember that advantages from one point of view may be disadvantages from another.

Boards of Trustees may have the following advantages:

- A Board can make rapid decisions on policy and handle many problems without consultation at a higher level.
- Water users will take pride in their district if they feel involved in its operation.
- A Board operating as a group provides room for discussion prior to decision.
- The responsibility for decisions is divided between trustees.
- Continuity in policy is maintained through election of trustees on a rotational basis.
- A Board can present a local problem to senior governments in terms of local needs.

They may have the following disadvantages:

- They have difficulty in obtaining sufficient financial backing.
- Their policies may be shorter term ones. The pressure to reduce costs in the short run may result in higher costs in the future.
- Boards may find it difficult to resist pressure from local groups because a trustee is elected rather than appointed.

Official Trusteeships [25/] may have the following advantages:

- Official Trustees can more easily resist local pressures.

[25/] An Official Trusteeship has all the appearances of a position created to iron out administrative difficulties of existing Boards of Trustees.

- Policies can be long term ones. Water service charges may include costs for high standards of rehabilitation.
- Financial assistance from the Provincial government may be more readily available.

The disadvantages of an Official Trusteeship may be that:

- The authority and responsibility for making policy decisions is placed in the hands of one person. The weight of decisions is not resting on the shoulders of a group.
- Continuity is more difficult to maintain with changes in appointment.
- Pride of ownership is forfeited.

A Manager - Advisory Committee form of administration may have the following advantages:

- Financial backing is secured.
- Technical help is readily available.
- Policies can be designed for a long term situation.
- Strong controls can be maintained during a development period.

The disadvantages may be that:

- All power and authority for policy making and managerial functions are vested in one man.
- The Manager's job becomes twofold as he is both the maker and the initiator of the policy.
- The Manager is directly responsible to the Minister of Agriculture on the one hand and serves the water users on the other. This may not be a desirable situation at all times.
- Pride of ownership by water users is forfeited.

A General Manager appointed by P.F.R.A. may have the following advantages:

- Financial backing is secured.
- Technical assistance is secured.
- Long term development and rehabilitation policies can be carried out.

Disadvantages may be that:

- Legislation and regulation for operation are lacking.
- Authority and responsibility are derived from a larger administration. Policy decision and changes in present status may be slow.

Within the framework of the policy making body the relationships between objectives, functions, policies and decisions need to be clarified. The policy making body has a set of objectives. These may be defined through written statement or implied through policies adopted and functions carried on by the administration. Few administrations in Southern Alberta had concise statements of their objectives. To those concerned their objectives are probably obvious. The objectives in any administration may include "... the equitable apportionment of water among the users in quantities sufficient to satisfy crop requirements; keeping the irrigation systems in top operation efficiency and providing sufficient maintenance and replacement to obtain the longest life and greatest use of the facilities." [26/] All these objectives are to be accomplished at the lowest possible cost to the water users.

Objectives determine policies. Policies in turn specify the functions which any irrigation district will adopt. Functions through the requirement for employment of human resources dictate organizational structure.

THE MANAGERIAL LEVEL

Management activates and co-ordinates human and physical resources to accomplish the objectives of the policy making level. As such, management performs a major role in the decision making process of an organization.

In irrigation administrations, management may make decisions on and be responsible for subjects such as budgets, equipment purchase and rental, insurance, water rights, small extensions and construction programs, employee-water user relations, hiring and firing, salaries, employee benefits, maintenance programs, and rate enforcement. Basically management is responsible for effecting any functions as discussed in Section II which are adopted as policy by the irrigation administration.

THE SUPERVISORY LEVEL

Supervisory roles are assigned to watermasters and foremen of construction, maintenance or survey crews. Their role is to facilitate directives

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[26/] McAndrews, C.J. - "Alberta's Experience in Irrigation".

passed to them by management, interpret these for the local area and effect them through the ditchriders or crews involved.

The watermasters co-ordinate the ordering and regulation of canal flows, the day to day maintenance of the works, and in some cases order supplies and materials from stores or direct from their own supplier. The day to day work decisions within a watermaster's area are usually made by him. Machine operators work under the supervision of a watermaster in his area.

An example of the duties that a watermaster may be responsible for are presented in the following job description:

DUTIES AND RESPONSIBILITIES [27]

1. Responsible directly to Superintendent.
2. Supervises, directs and controls all Ditchriders, Machine Operators and other seasonal employees concerned with maintenance and operation of the District.
3. Supervises, directs and controls all maintenance and operation of the District.
4. Receives and places bulk orders for irrigation water and directs its distribution and flow through the canals of the District.
5. Submits weekly data to Superintendent and Manager showing the amount of water ordered, the amount received, and gauge readings on both canal and reservoir elevations.
6. Supervises and directs, with consent of Superintendent, all major projects concerning the maintenance, improvement and extension of the District.
7. Prepares annual estimate of expenditures for the District and submits to the Superintendent for discussion and approval.
8. Writes Purchase Orders for all purchases of materials, supplies, equipment, fuel and repairs necessary for the function of the District.
9. Submits written and verbal reports to the Superintendent and Manager as required.

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[27] Eastern Division S.M.R.D.

THE EMPLOYEE LEVEL

Employee roles are many and varied. They include ditchriders, rodmen, instrument men, laborers, machine operators, truck drivers, carpenters, caretakers, storemen, clerks and stenographers. All administrations in Southern Alberta have the ditchrider as a basic administrative unit. He is front line management.[28/] Personal contact and service are part of his day to day job. Living in the community is a natural consequence. The ditchrider receives orders for water, requests supplies for his unit and delivers them to the water users. The ditchrider performs an inspection service as well. While servicing water users he is able to spot weaknesses in the canal system.

In some administrations he may be responsible for supervision of seasonal workmen. In the off season, the ditchrider may become a part of a construction crew or may be laid off.

ORGANIZATIONAL CHARTS

Information on form of administration, objectives, policies, functions adopted, and levels of organization in existence for each administration have been summarized in the form of organizational charts. These are presented from Page 26 to Page 40. The St. Mary and Milk Rivers Development contains a special chart to show the relationship between the administrations involved.

In reviewing the organizational charts some observations can be made. Administrations vary in size as measured by the number of employees.

As administrations increase in numbers of employees the organizational levels increase from two to four. In small administrations only the policy and employee levels are apparent.

With a split of duties between the Secretary-Treasurer and the District Manager, authority is divided and decision making appears to be one of agreement. Neither person has authority over the other. Decision on many items may require Board sanction.

In the largest administrations, policy, managerial, supervisory and em-

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[28/] White, R.T., General Manager, E.I.D.

ployee levels appear. As size of structure increases the quantity of decisions to be made has resulted in increased delegation of authority and responsibility. The consequence is the creation of positions such as a Manager or General Manager. There appear to be advantages to delegating authority and responsibility to a manager. The manager is employed on a continual basis. He can act on major problems or crises without waiting for Board action. As well, he has knowledge of all aspects of a particular administration.

In the organizational charts, the degree of separation of employees by the functions they perform, i.e. departmentalization, increases with size. Specialization would be difficult in small administrations where only a few employees carry out all functions adopted.

Administrations appear to have no, or only a small compliment of, staff employees.[29/] These usually consist of accountants, clerks and stenographers. Most administrations hire consultants on a fee basis or use services provided by senior governments. Advice has been obtained for legal and engineering matters.

There are common denominators for three of the four administrative levels. These are the elected representative, the watermaster, and the ditchrider.

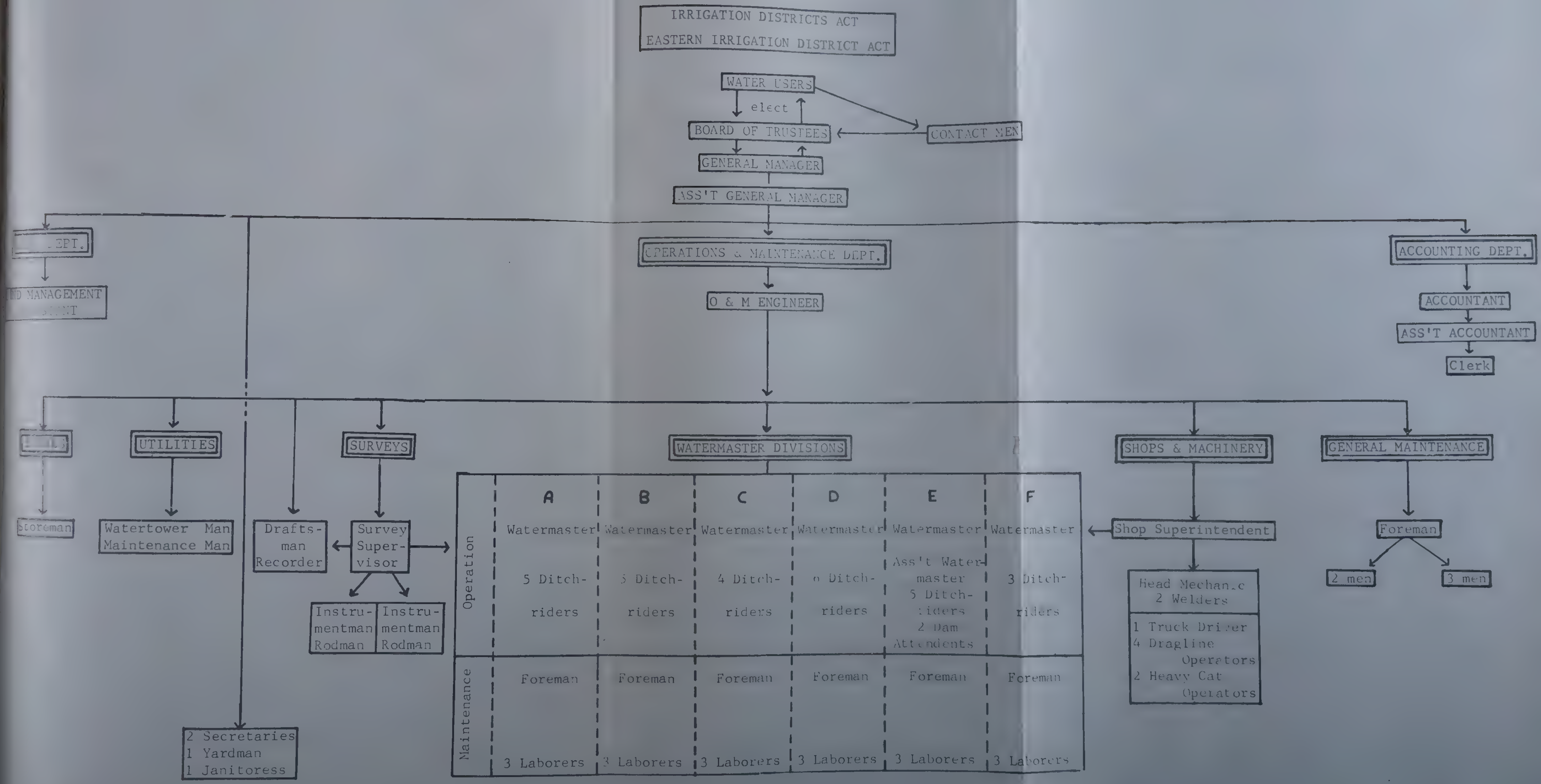
The amount of personnel will vary with the services provided. For example the E.I.D., W.I.D., B.R.P., Eastern Division of the S.M.R.D., T.I.D., M.I.D., U.I.D., L.N.I.D., M.V.I.D., L.I.D., and A.I.D. all deliver water to the farm quarter.[30/] The R.I.D. and Western Division of the S.M.R.D. deliver to the farmer laterals. The B.R.P., S.M.R.D. and Water Resources Branch of the Alberta Department of Agriculture, are involved in wholesaling, storing, and transporting of water. There is a cut back in staff where service is not provided to the farm quarter and an increase where wholesaling is carried out.

[29/] Staff employees advise, but have little authority for decision making. Line employees have authority delegated to them to make decisions regarding operation and maintenance. On an organization chart, line employees have a direct line from the policy making body to the managerial level, to the supervisor, to the employee. Staff employees have no authority over the employees who are concerned with the operation function.

[30/] Variations in water delivery services are bound to have an effect on rates. According to Operation and Maintenance personnel of irrigation administrations, eighty per cent of the cost of maintenance of an irrigation system is found to be in canals with a flow of less than 50 cubic feet per second. As maintenance is a high proportion of the cost of running an irrigation administration, this cost will be reflected in the rate.

ORGANIZATION CHART
EASTERN IRRIGATION DISTRICT

formed and operated under



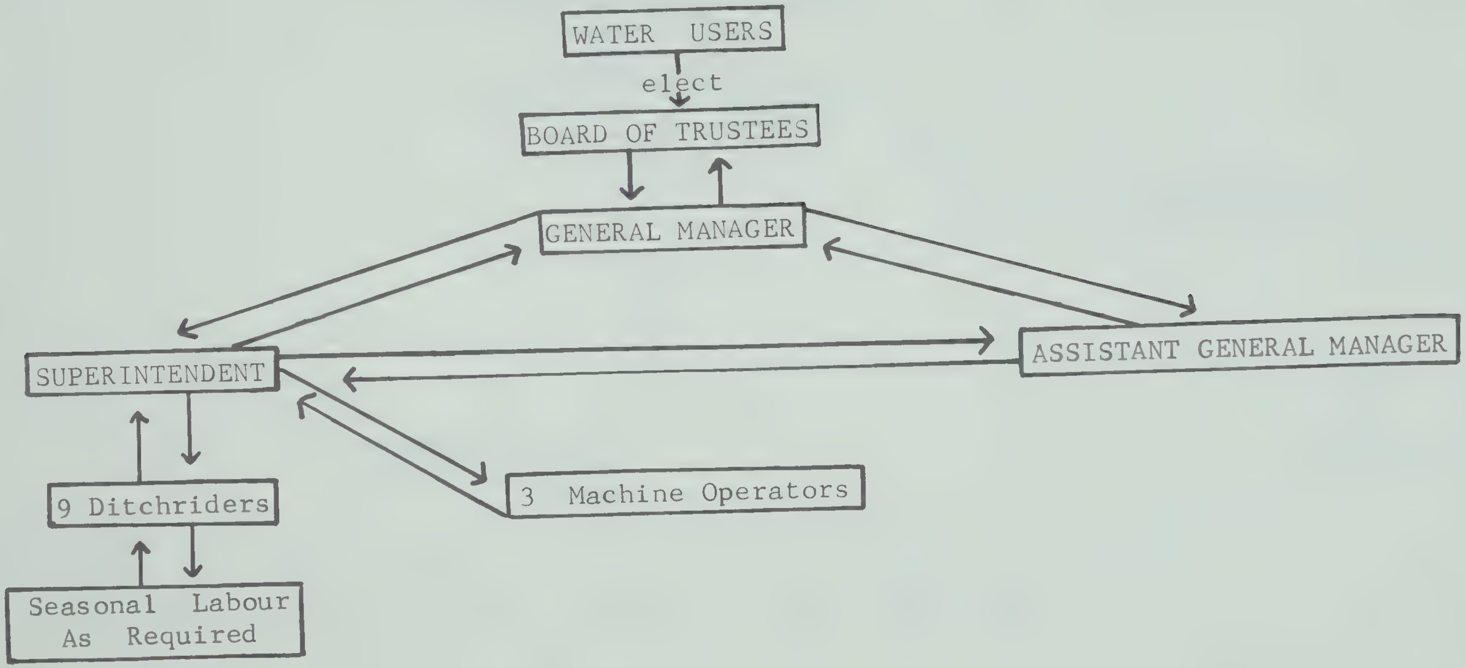
▭ Double barred headings show a function of administration.

ORGANIZATION CHART

WESTERN IRRIGATION DISTRICT

formed and operated under

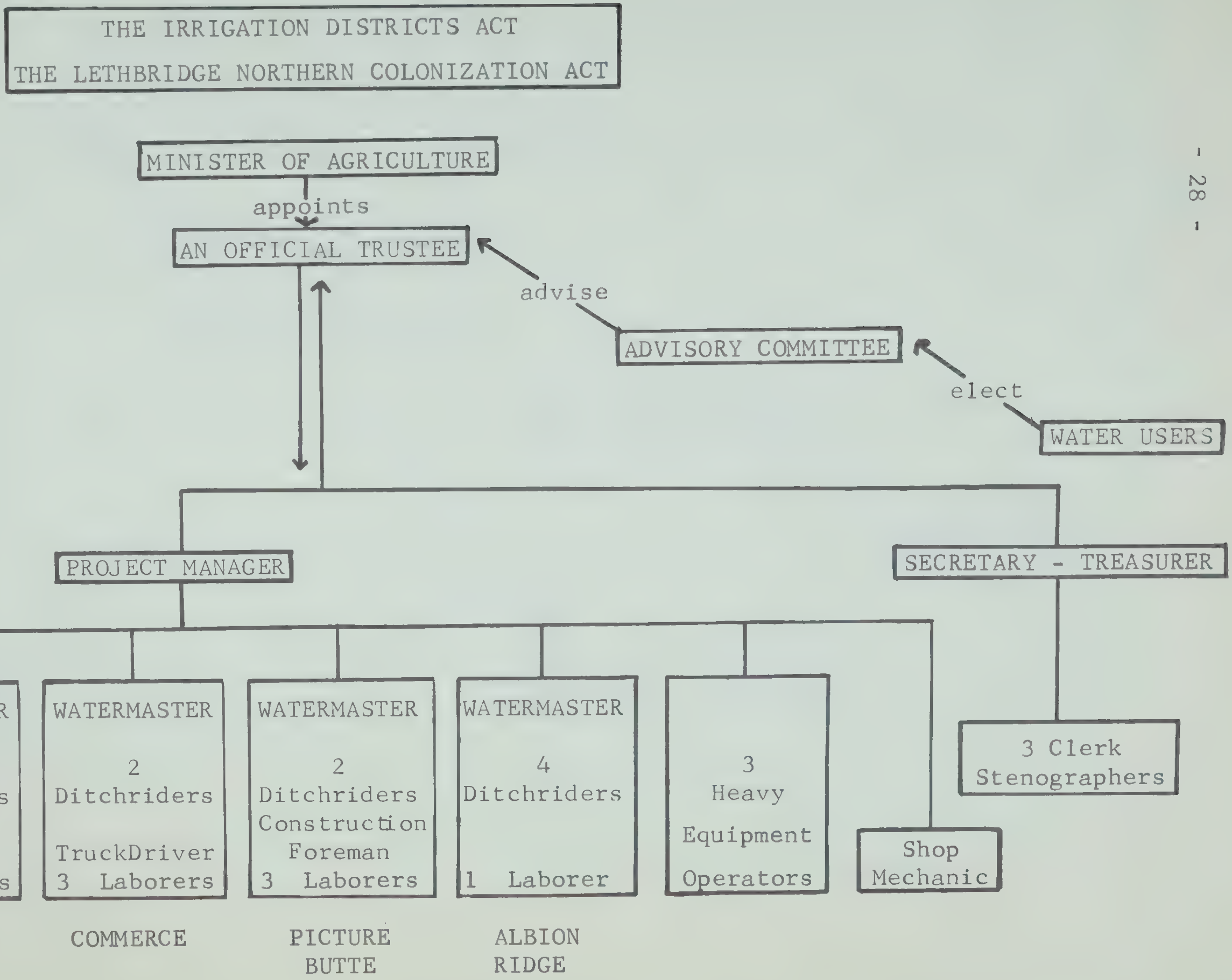
THE WESTERN IRRIGATION DISTRICTS ACT
THE IRRIGATION DISTRICTS ACT



ORGANIZATION CHART

LETHBRIDGE NORTHERN IRRIGATION DISTRICT

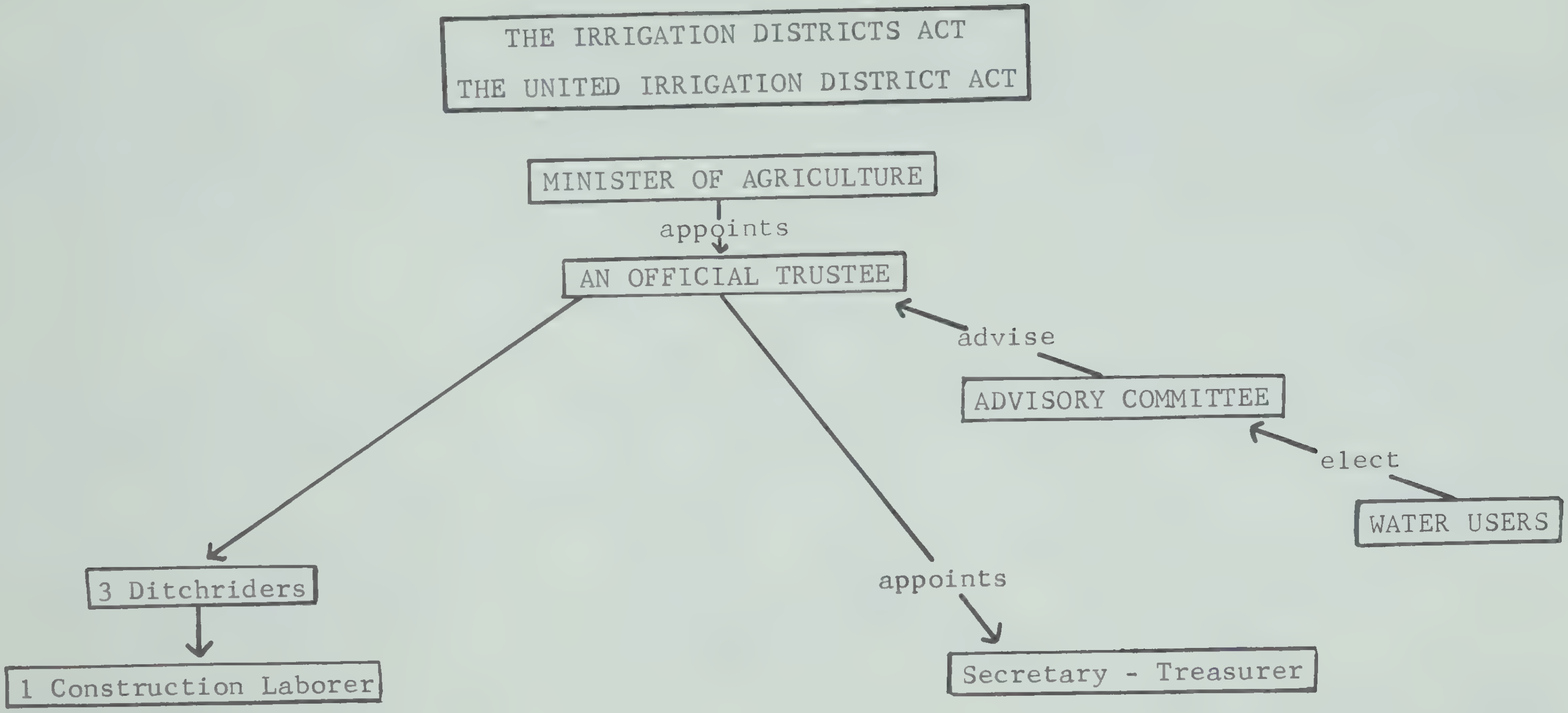
formed and operated under


THE IRRIGATION DISTRICTS ACT
THE LETHBRIDGE NORTHERN COLONIZATION ACT
MINISTER OF AGRICULTURE
appoints
AN OFFICIAL TRUSTEE
advise
ADVISORY COMMITTEE
elect
WATER USERS
PROJECT MANAGER
SECRETARY - TREASURER
Headgates Ditchrider
WATERMASTER 2 Ditchriders TruckDriver 3 Laborers
MACLEOD
WATERMASTER 3 Ditchriders 2 Laborers
MONARCH
WATERMASTER 2 Ditchriders TruckDriver 3 Laborers
COMMERCE
WATERMASTER 2 Ditchriders Construction Foreman 3 Laborers
PICTURE BUTTE
WATERMASTER 4 Ditchriders 1 Laborer
ALBION RIDGE
3 Heavy Equipment Operators
Shop Mechanic
3 Clerk Stenographers

ORGANIZATION CHART

UNITED IRRIGATION DISTRICT

formed and operated under



ST. MARY SYSTEM'S STRUCTURE OF ADMINISTRATION
for
MAKING POLICY AND REGULATION

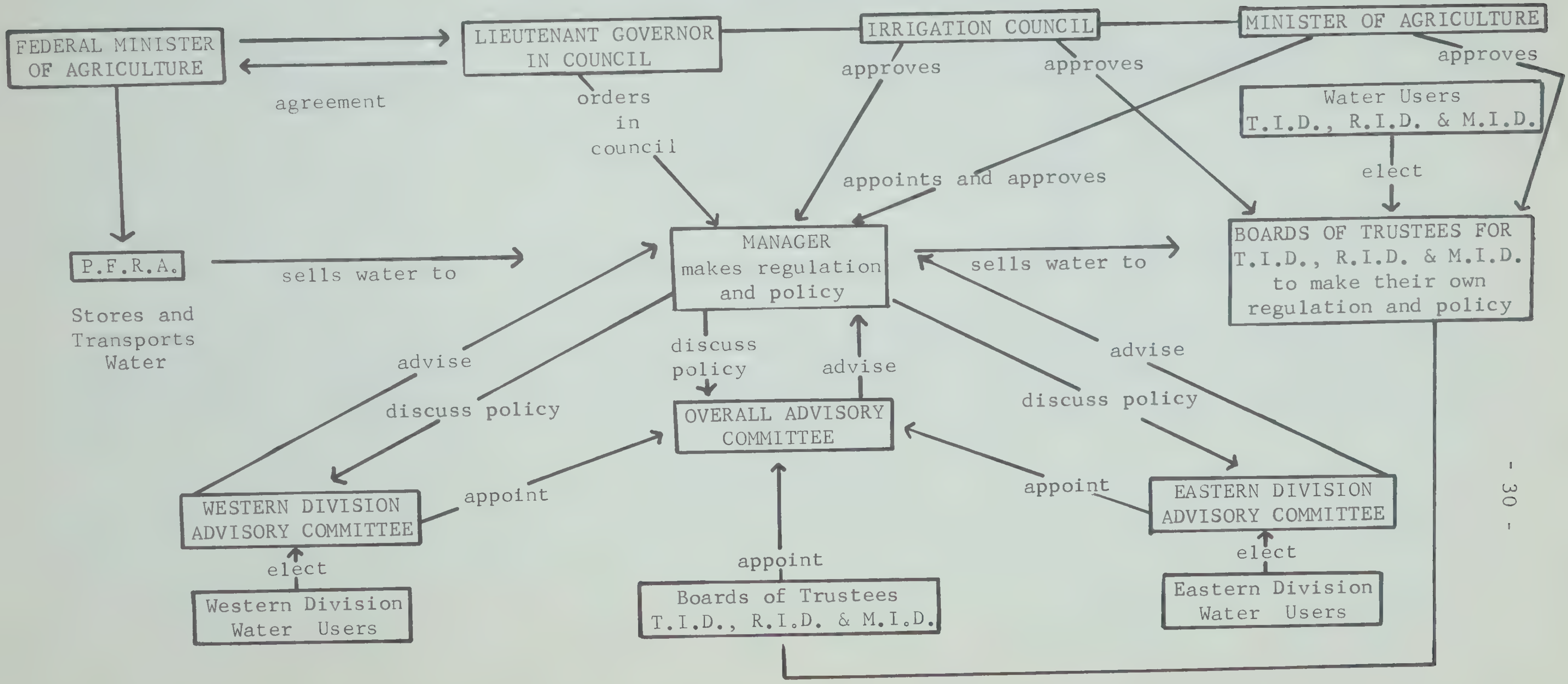
formed and operated under

A FEDERAL ACT

THE ST. MARY AND MILK RIVERS DEVELOPMENT ACT

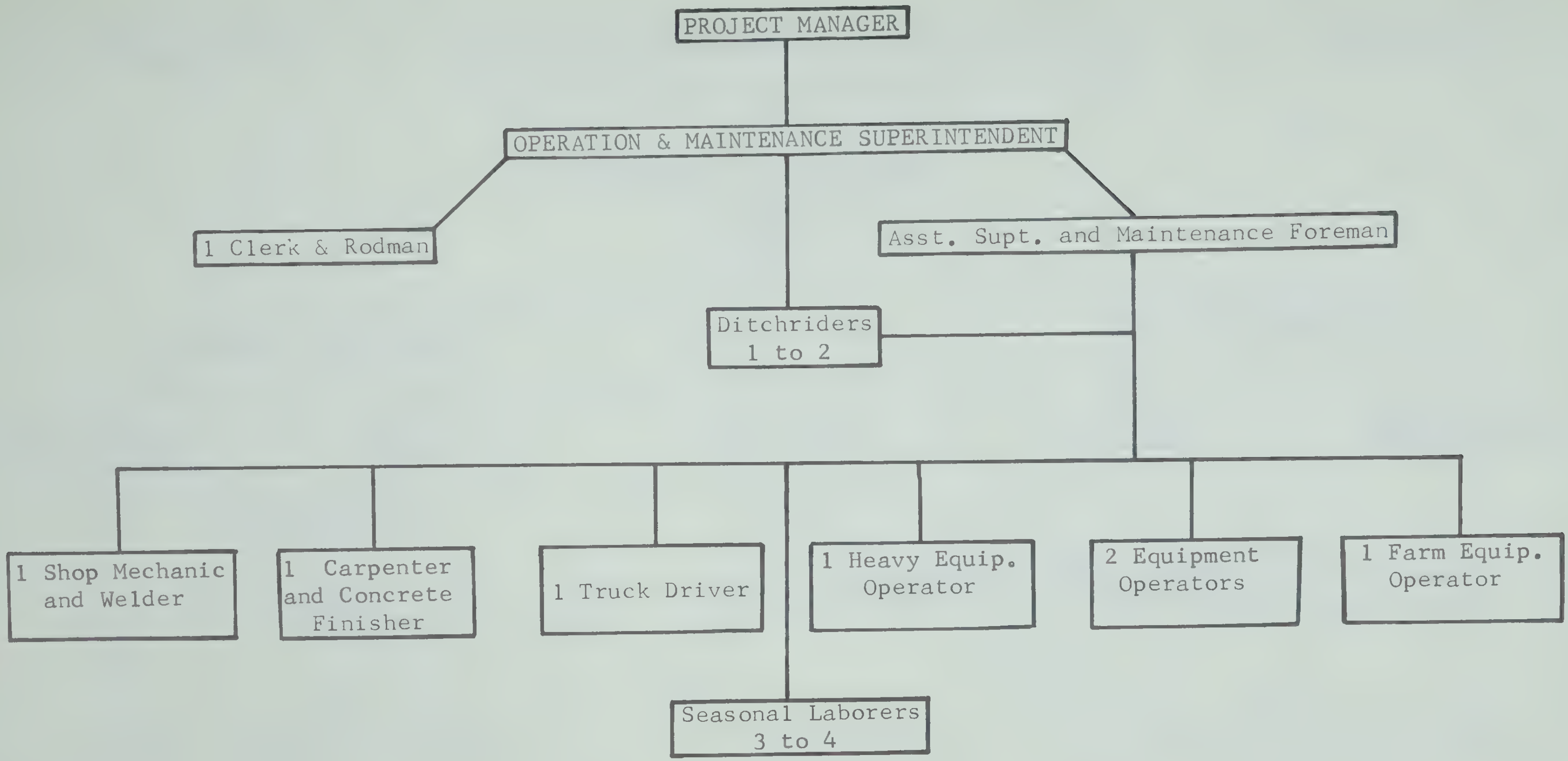
THE IRRIGATION DISTRICTS ACT

FEDERAL - PROVINCIAL AGREEMENT


FEDERAL MINISTER OF AGRICULTURE
agreement
LIEUTENANT GOVERNOR IN COUNCIL
orders in council
IRRIGATION COUNCIL
approves
approves
MINISTER OF AGRICULTURE
approves
appoints and approves
Water Users T.I.D., R.I.D. & M.I.D.
elect
P.F.R.A.
Stores and Transports Water
sells water to
MANAGER makes regulation and policy
sells water to
BOARDS OF TRUSTEES FOR T.I.D., R.I.D. & M.I.D. to make their own regulation and policy
advise
discuss policy
discuss policy
advise
advise
discuss policy
OVERALL ADVISORY COMMITTEE
appoint
appoint
appoint
WESTERN DIVISION ADVISORY COMMITTEE
elect
Western Division Water Users
Boards of Trustees T.I.D., R.I.D. & M.I.D.
EASTERN DIVISION ADVISORY COMMITTEE
elect
Eastern Division Water Users

ORGANIZATION CHART

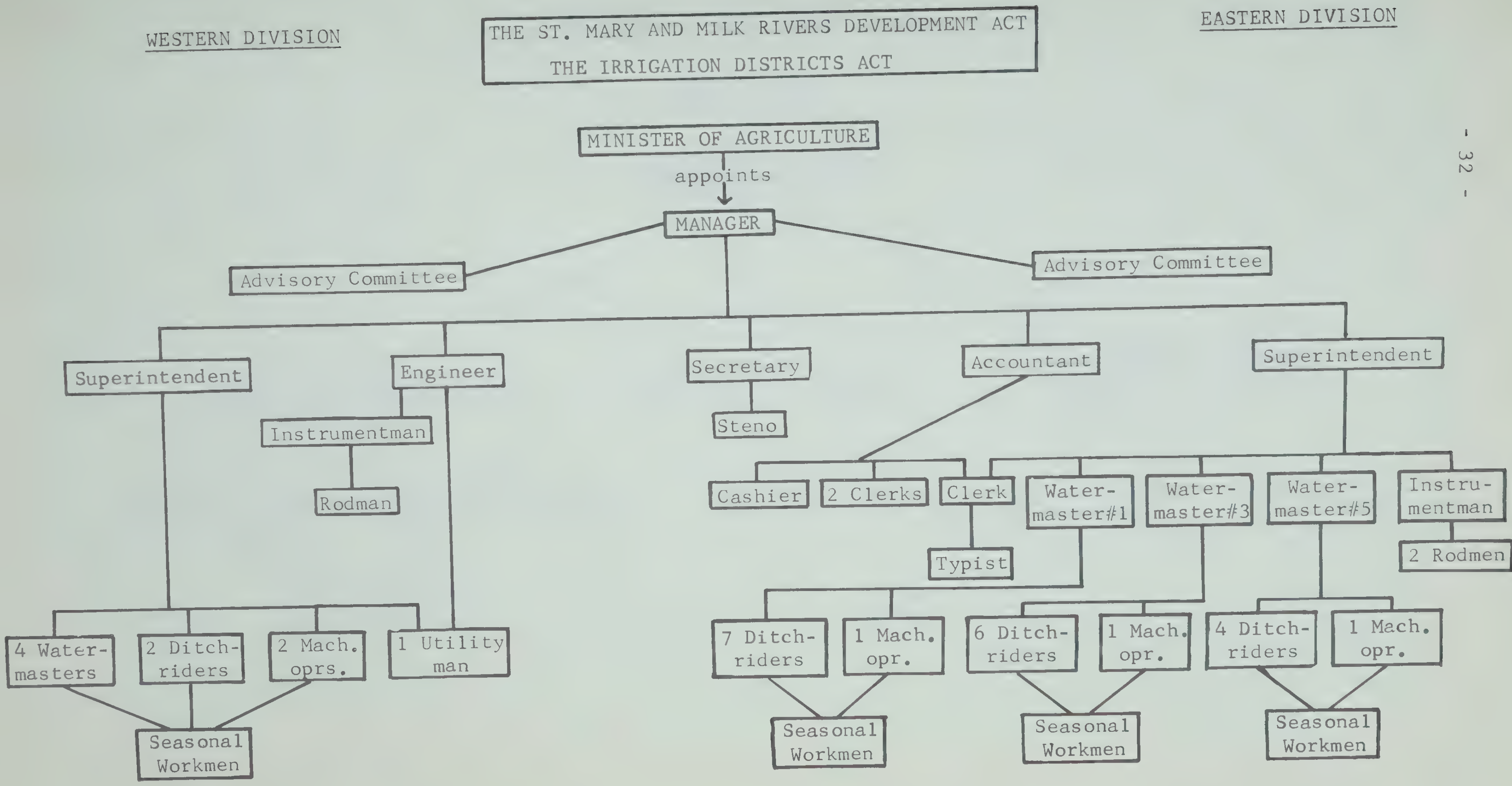
PRAIRIE FARM REHABILITATION ADMINISTRATION, ST. MARY AND MILK RIVERS DEVELOPMENT



ORGANIZATION CHART

ST. MARY & MILK RIVERS DEVELOPMENT

formed and operated under

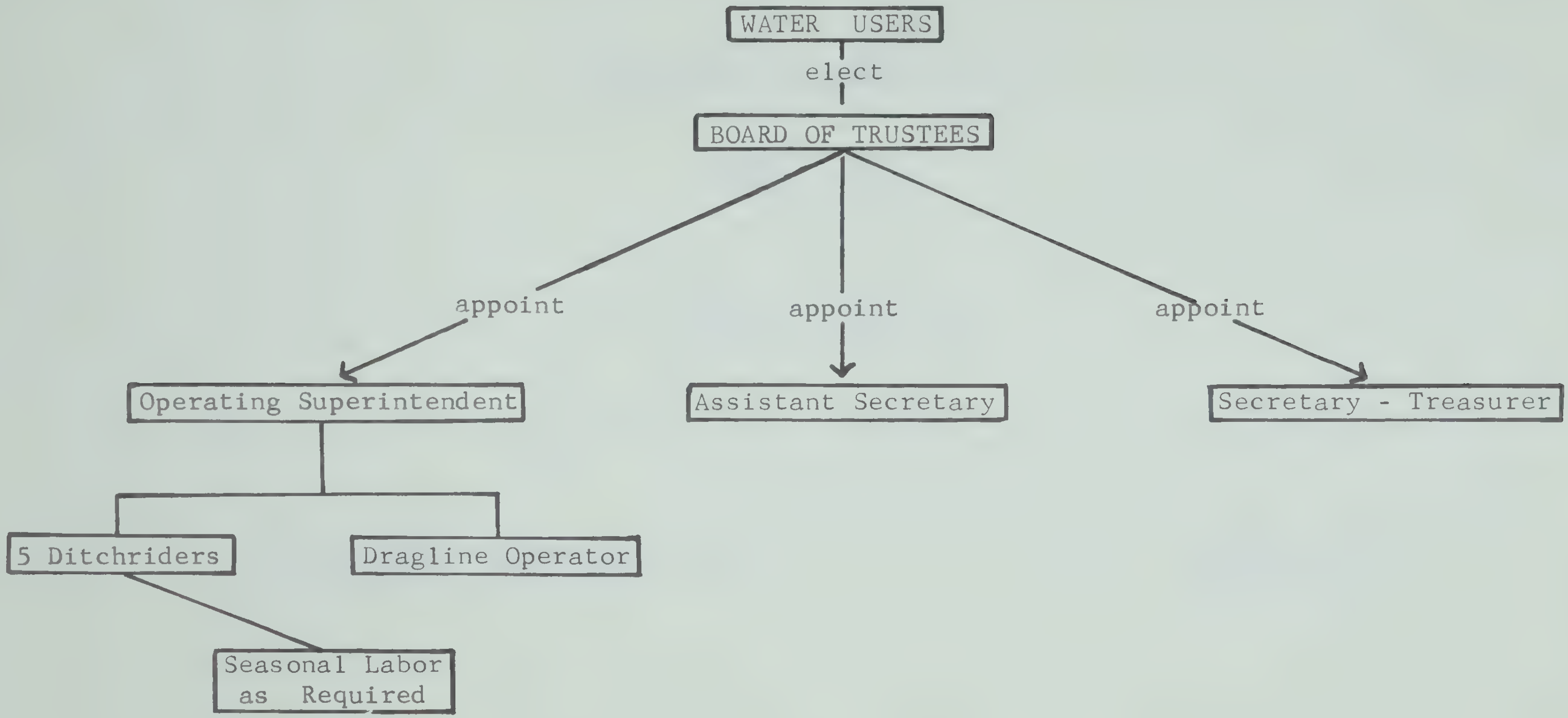


ORGANIZATION CHART

TABER IRRIGATION DISTRICT

formed and operated under

THE IRRIGATION DISTRICTS ACT

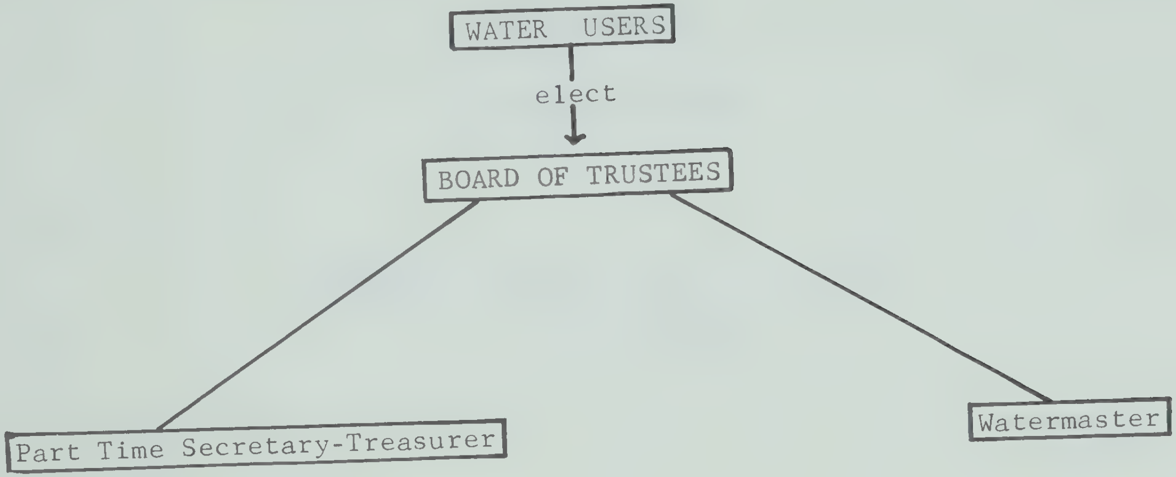


ORGANIZATION CHART

RAYMOND IRRIGATION DISTRICT

formed and operated under

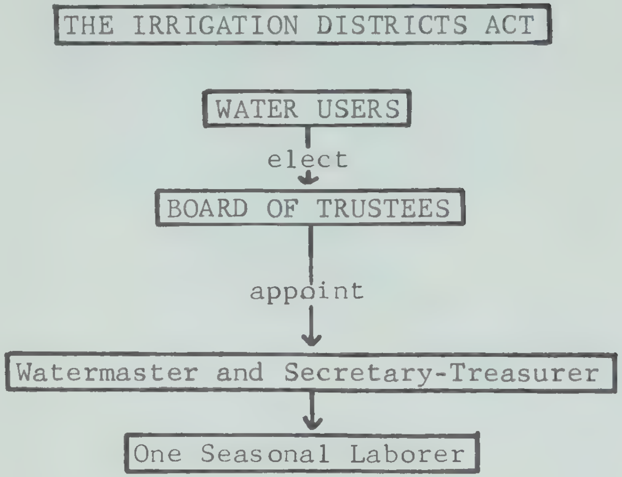
THE IRRIGATION DISTRICTS ACT



ORGANIZATION CHART

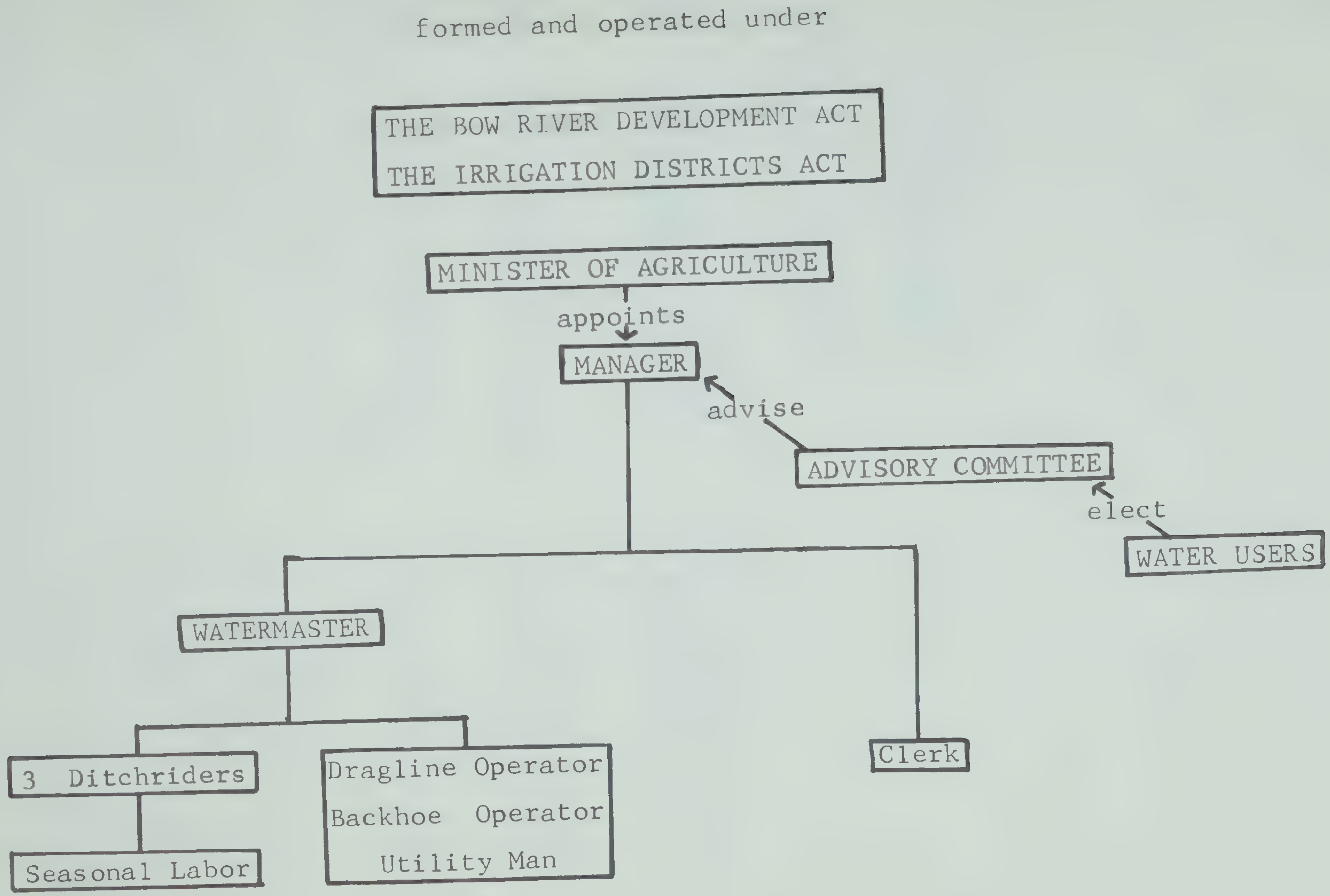
MAGRATH IRRIGATION DISTRICT

formed and operated under


THE IRRIGATION DISTRICTS ACT
WATER USERS
elect
BOARD OF TRUSTEES
appoint
Watermaster and Secretary-Treasurer
One Seasonal Laborer

ORGANIZATION CHART

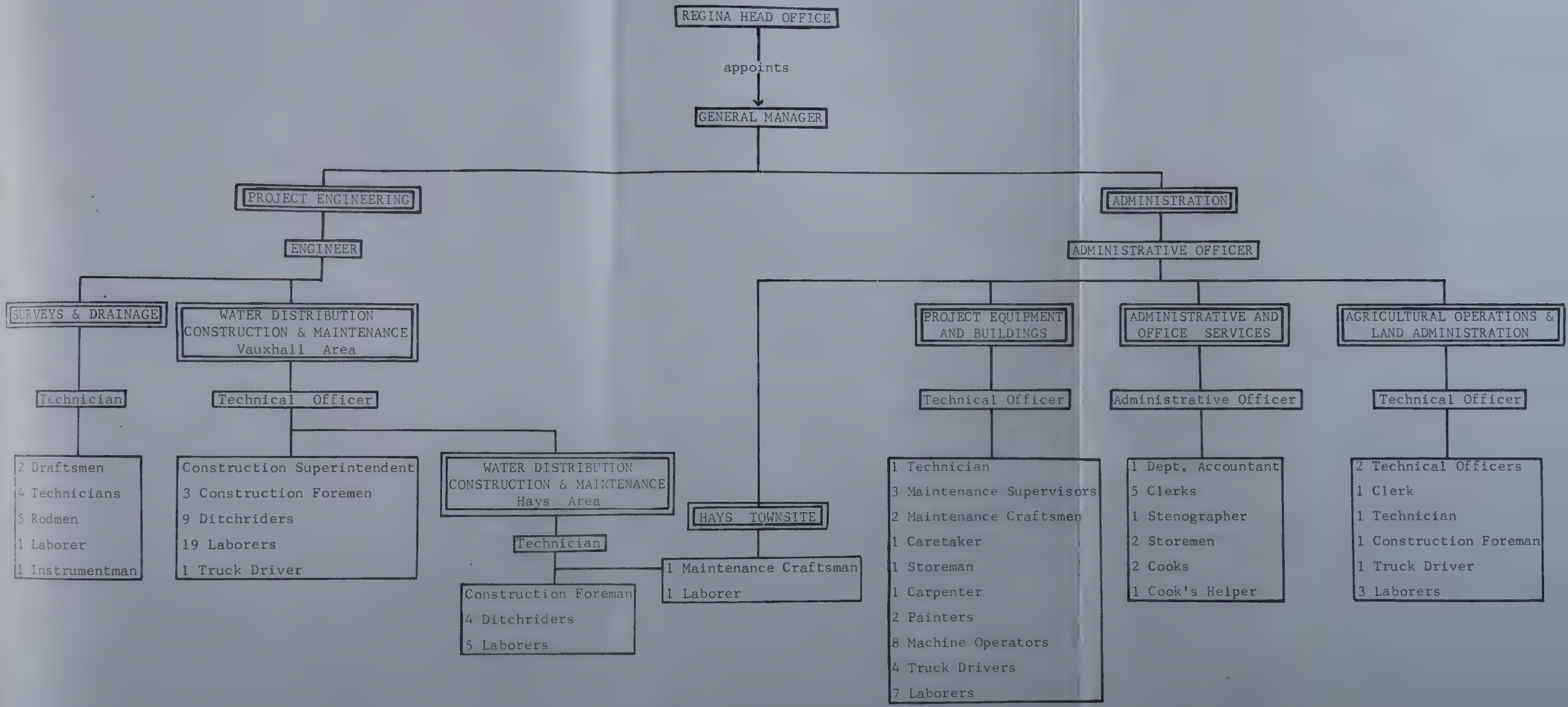
BOW RIVER DEVELOPMENT



ORGANIZATION CHART

PRAIRIE FARM REHABILITATION ADMINISTRATION

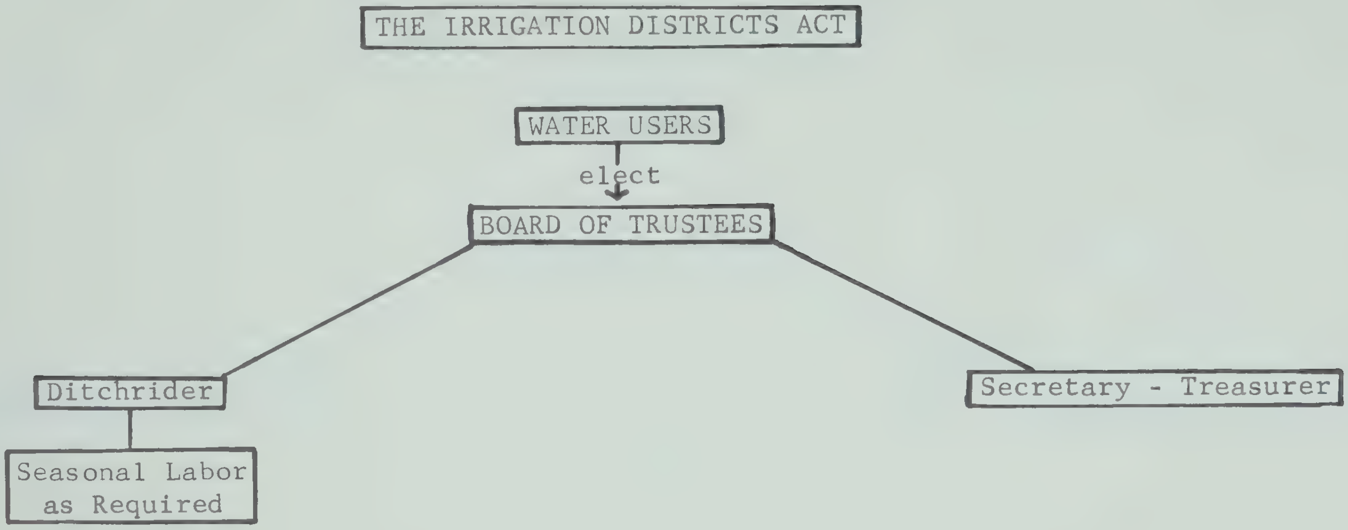
BOW RIVER PROJECT



ORGANIZATION CHART

MOUNTAIN VIEW IRRIGATION DISTRICT

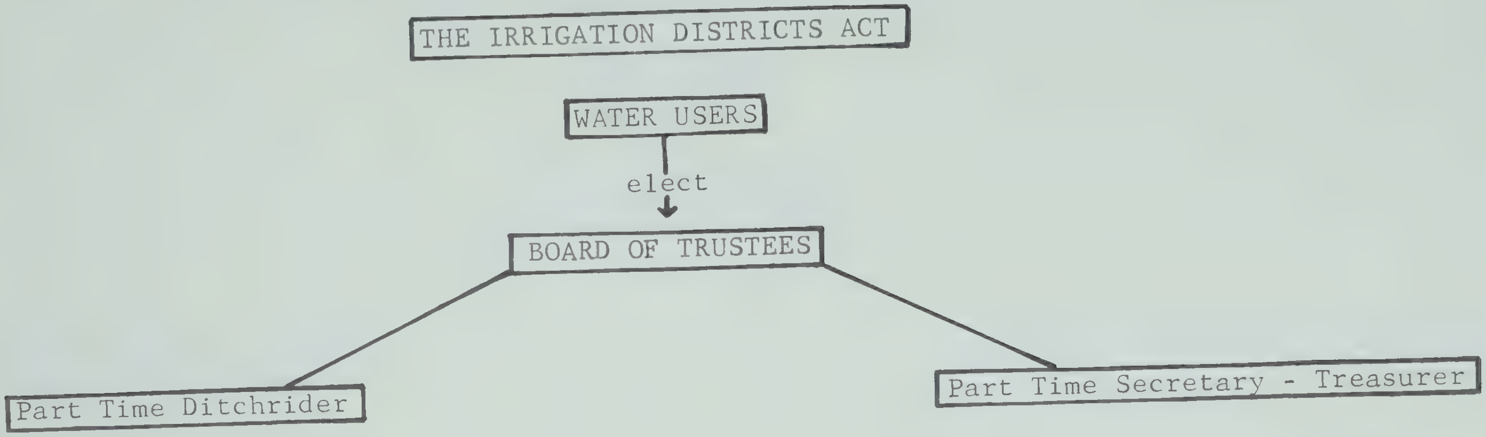
formed and operated under



ORGANIZATION CHART

LEAVITT IRRIGATION DISTRICT

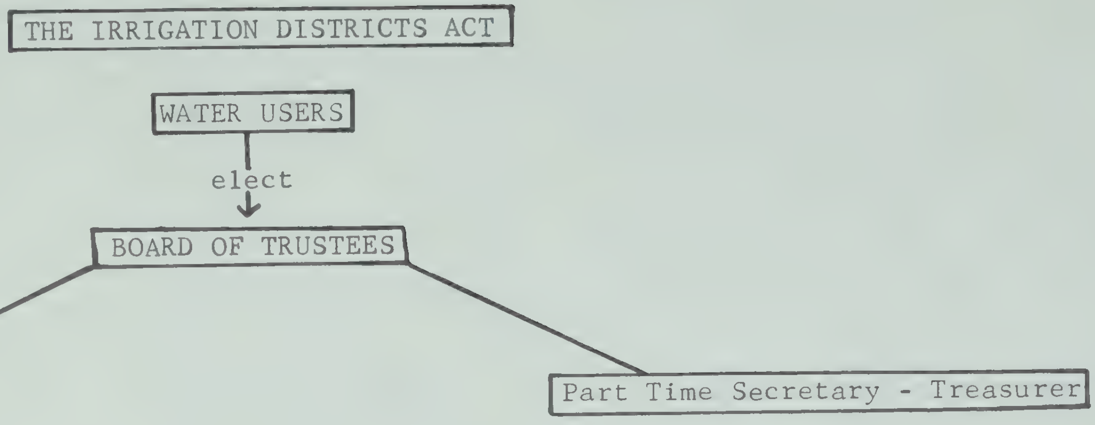
formed and operated under



ORGANIZATION CHART

AETNA IRRIGATION DISTRICT

formed and operated under



When discussing the relationships between the organizational charts it was noted that with the growth of an irrigation administration the number of administrative levels is increased. This is common phenomenon in business which results from the physical limitations of human beings. Business administrators express these limitations in terms of spans of control, knowledge, distance, physical endurance and mental energy.

The span of control is found at two levels in larger irrigation administrations. Information from texts on business administration [31/] suggest that the common span of control for the managerial level is from 3 to 8 people. At the supervisory level, depending upon the amount of authority delegated, the span of control may increase to 30 employees.

The span of knowledge comes into effect in some organizations where one or a few people must deal with all aspects of an administration. Increased size allows for specialization and to some degree overcomes this limitation. The larger the administration the more likely management will be removed from the water user, while a small administration can keep in personal touch. In some cases such as the S.M.R.D., the central office is located about 100 miles from its eastern water users in the area near Medicine Hat. To overcome this limitation a regional office has been set up at Bow Island.

[31/] Flippo, Edwin P. - "Principles of Personnel Management" McGraw Hill, 1961.
Davis, Keith - "Human Relations in Business" McGraw Hill, 1957.

MEASUREMENT OF ADMINISTRATIVE UNITS IN IRRIGATION ORGANIZATIONS

The measurement of any work relationships may tend to "ruffle the feathers" of those performing the work. Comparisons can be made only in a general way as quality of human performance can seldom be measured quantitatively.

The justification for such measurement is based on the premise that physical data helps to comprehend the scope of any administrative unit under discussion. What does a Watermaster's unit consist of? What does a ditchrider's area contain?

In consultation with irrigation administrators, physical measurements were chosen for three levels of administration. The measurements included water users, irrigable acreage, miles of canal excluding ditches and drains, number of turnouts, and number of structures. Differences in accessibility of information has led to some estimation, e.g. miles of canals.

Table III, "Selected Measurements of Administrative Units" was derived from Appendix I. The measurements in Table III are weighted averages of 73 per cent of the irrigable acreage in Southern Alberta. Administrations chosen showed the greatest comparability. These were the E.I.D., the Eastern Division of the S.M.R.D., the B.R.P., L.N.I.D., T.I.D. and the B.R.D.

The average Elected Representative, whether on a Board of Trustees or an Advisory Committee, is responsible for the interests of 134 water users. His area of responsibility includes about 19,000 assessed irrigable acres.

The average Watermaster, supervises the transportation and distribution of water through 200 miles of canal to about 30,000 assessed irrigable acres. The water is released through about 440 turnouts. A Watermaster supervises between 4 and 5 ditchriders on the average, i.e. 30,000 acres ÷ 6000 = 5.

The average ditchrider delivers water through 46 miles of canal and 100 turnouts to 6800 irrigable acres. The greatest uniformity between range of variation and weighted average figures appears at the ditchrider level. This unit appears most often for all administrations. Other positions vary in name, size and duties.

TABLE III

SELECTED MEASUREMENTS OF ADMINISTRATIVE UNITS

	Wtd. Average	Range For Various Irrigation Administrations
Elected Representative Factors:		
No. of Water Users Served	134	58-262
Area of Responsibility (Expressed as assessed irrigable acreage.)	19,158	6783-38173
Watermaster Factors:		
Assessed Irrigable Acres	29,801	18,131-47,300
No. of Miles of Canal	200	125-280
No. of Turnouts	438	234-652
Ditchrider Factors:		
Assessed Irrigable Acres	6,790	6163-7277
No. of Miles of Canal	46	37-60
No. of Turnouts	100	94-198

- -

Budget figures used by the Bureau of Reclamation, U.S. Government, for estimating the administrative needs of a project, are presented in Table IV. The ditchrider factors closely resemble those in Table III. Watermaster factors describe a larger area. More ditchriders are supervised by one watermaster.

TABLE IV

BUDGET FIGURES FOR ADMINISTRATIVE UNITS [32]

	Missouri Slope	West Lake Plain	East Lake Plain
Total Acreage	50,000	174,000	271,000
Number of Water Districts	1	3	5
Average Number of Acres per Water District	50,000	58,000	54,200
Average Number of Ditchriders per Water District	9	9	8
Average Number of Acres Served by each Ditchrider	5,555	6,444	6,775
Average Number of Farm Turnouts served by each Ditchrider	103	99	95

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[32] United States Department of the Interior, Bureau of Reclamation, Region 6, Oahe Unit, James Division, South Dakota, Missouri River Basin Project.

To envisage administrative levels in another way, maps of selected administrations follow showing Watermaster Divisions, Ditchrider Units or both. The maps include one each of the E.I.D., the W.I.D., the L.N.I.D., and the U.I.D. and one showing the S.M.R.D. which consists of P.F.R.A. administration on the headworks, the M.I.D., the R.I.D., the T.I.D. and the Western and Eastern Divisions of the S.M.R.D.

The E.I.D. has 6 Watermaster Divisions designated A to F. Ditchrider units are given numeral subscripts within each Watermaster Division. Irrigation in the E.I.D. is spread in blocks with connecting canals and works.

The W.I.D. has 9 ditchrider units controlled by a Superintendent. Assessed irrigable land is distributed more sparsely. Ditchrider units are likely to serve less irrigable acres and patrol more miles of canal than the averages shown in Table III.

The L.N.I.D. map depicts Watermaster Divisions. Assessed irrigable acreage is very concentrated compared to the W.I.D.

The U.I.D. has three ditchrider units with no direct supervision.

Beginning at the headworks of the S.M.R.D. and following the main canal east it can be seen that the M.I.D. and the T.I.D. have one Watermaster each. The R.I.D. delivers to the water users' laterals, while the M.I.D. delivers to the water user's quarter.

The Western Division of the S.M.R.D. has 4 Watermasters and 2 ditchriders. The Watermasters have a larger area than the ditchriders. They deliver water to each water users' lateral where it is distributed co-operatively from then on, whereas ditchriders deliver to each quarter.

The T.I.D., in 1964 [33/], had 5 ditchriders. The Watermaster function was fulfilled by an Operating Superintendent.

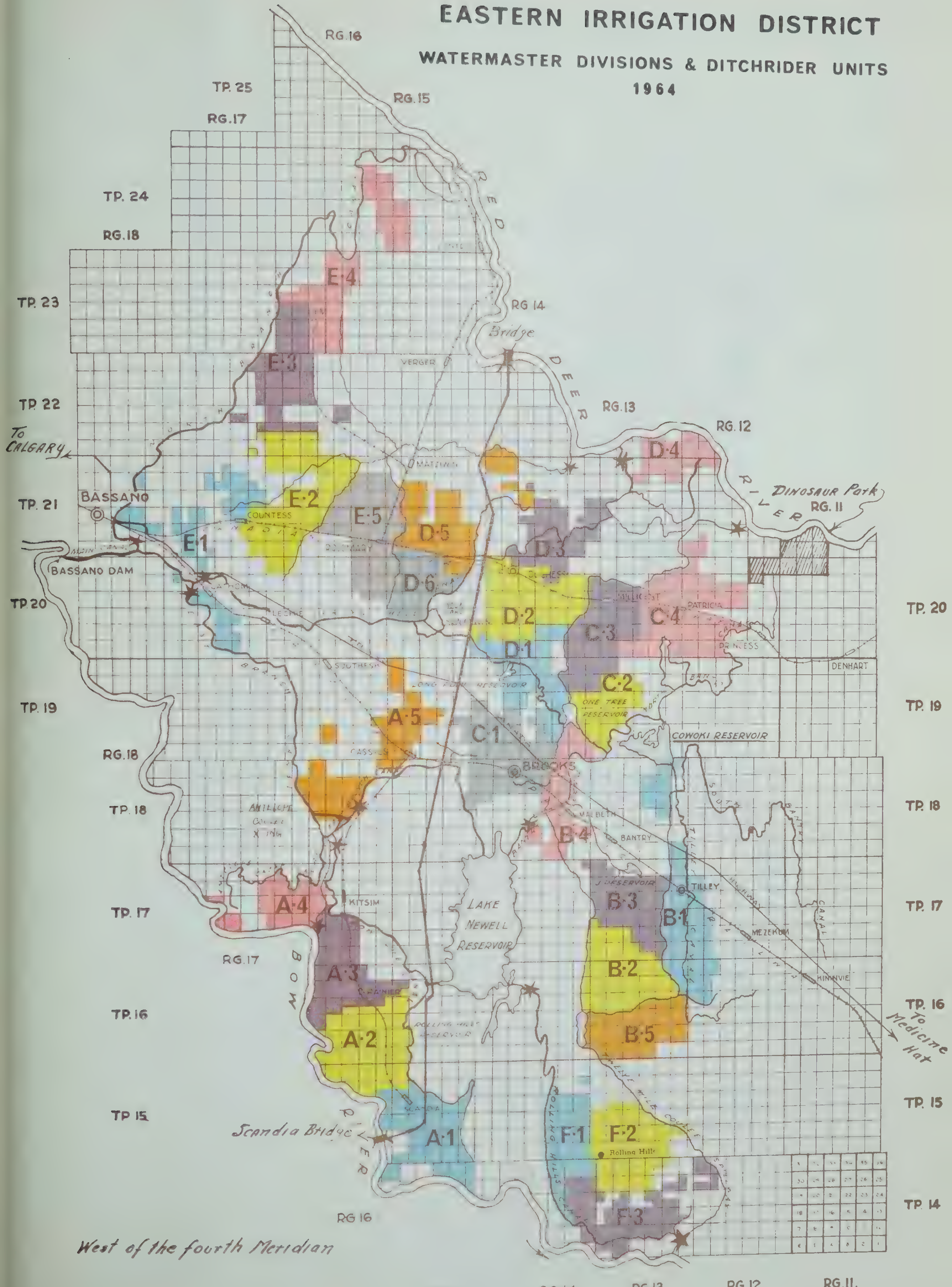
The Eastern Division of the S.M.R.D has three Watermaster Division, E_1, E_3 and E5. Ditchrider units are designated by color within each Watermaster Division.

[33/] In 1965 the ditchrider units of East Horsefly and North Fincastle were transferred from the Eastern Division of the S.M.R.D. to the T.I.D.

EASTERN IRRIGATION DISTRICT

WATERMASTER DIVISIONS & DITCHRIDER UNITS

1964



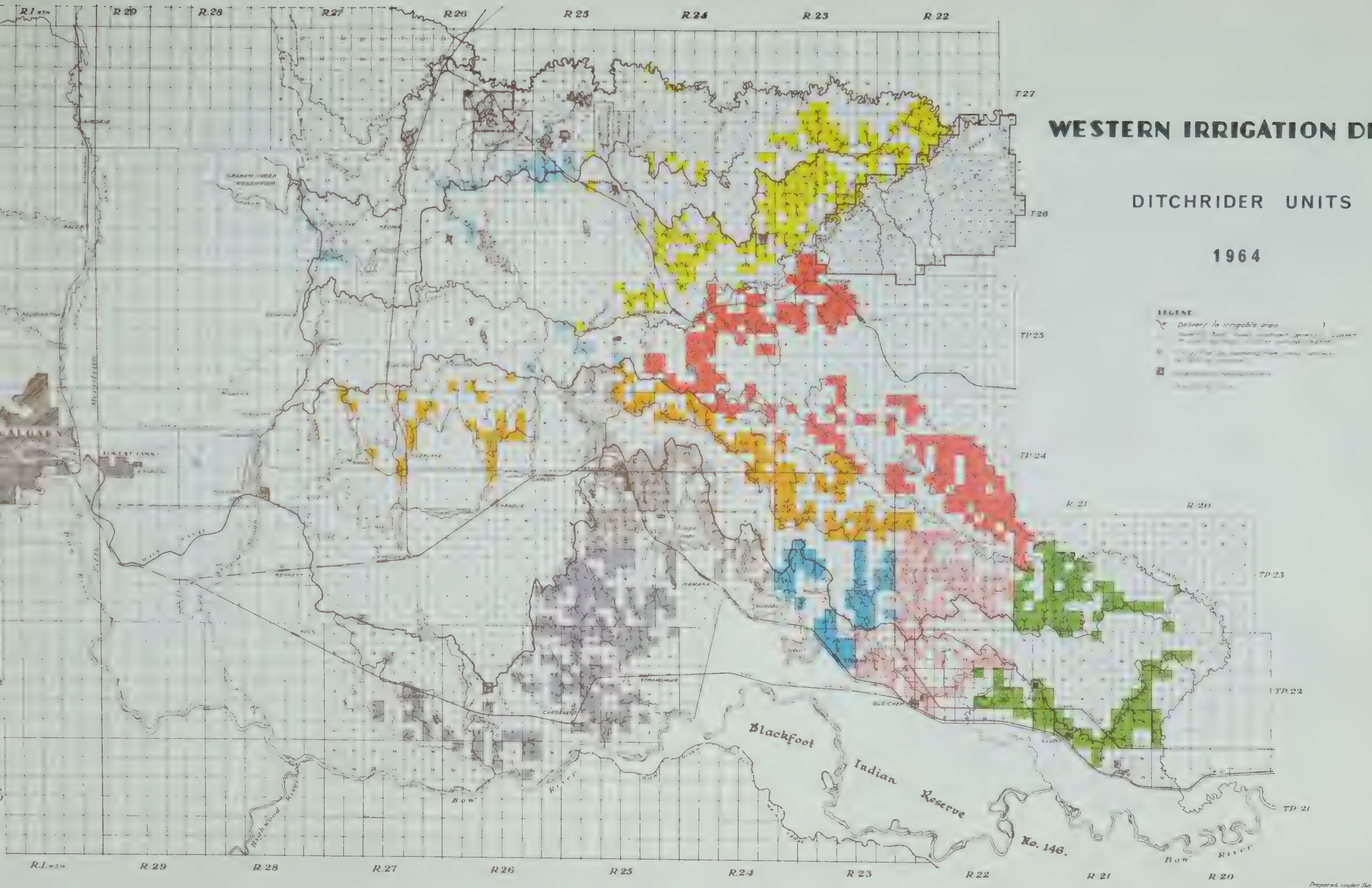
★ GAUGING STATIONS.

Prepared By E.I.D.

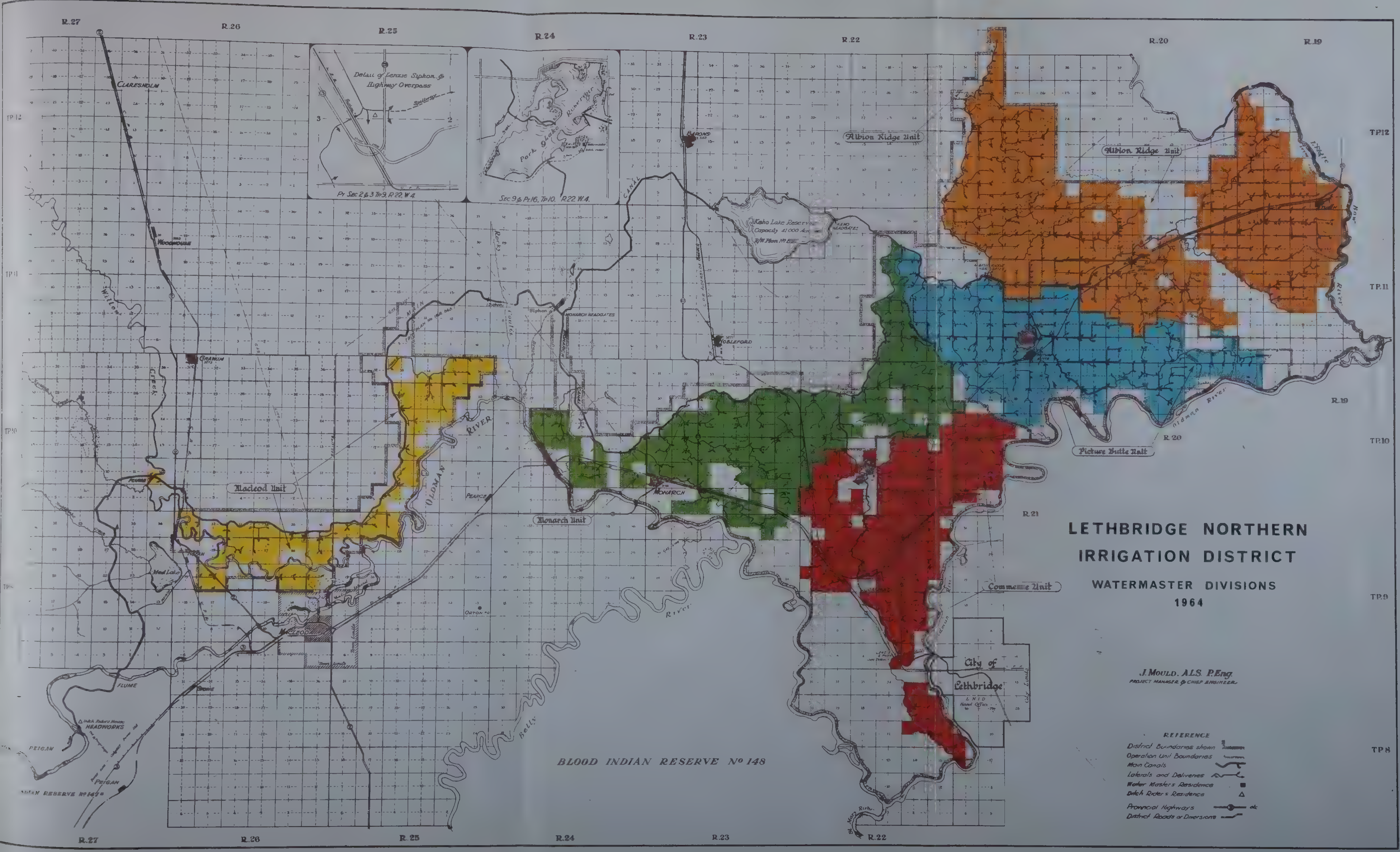
WESTERN IRRIGATION DISTRICT

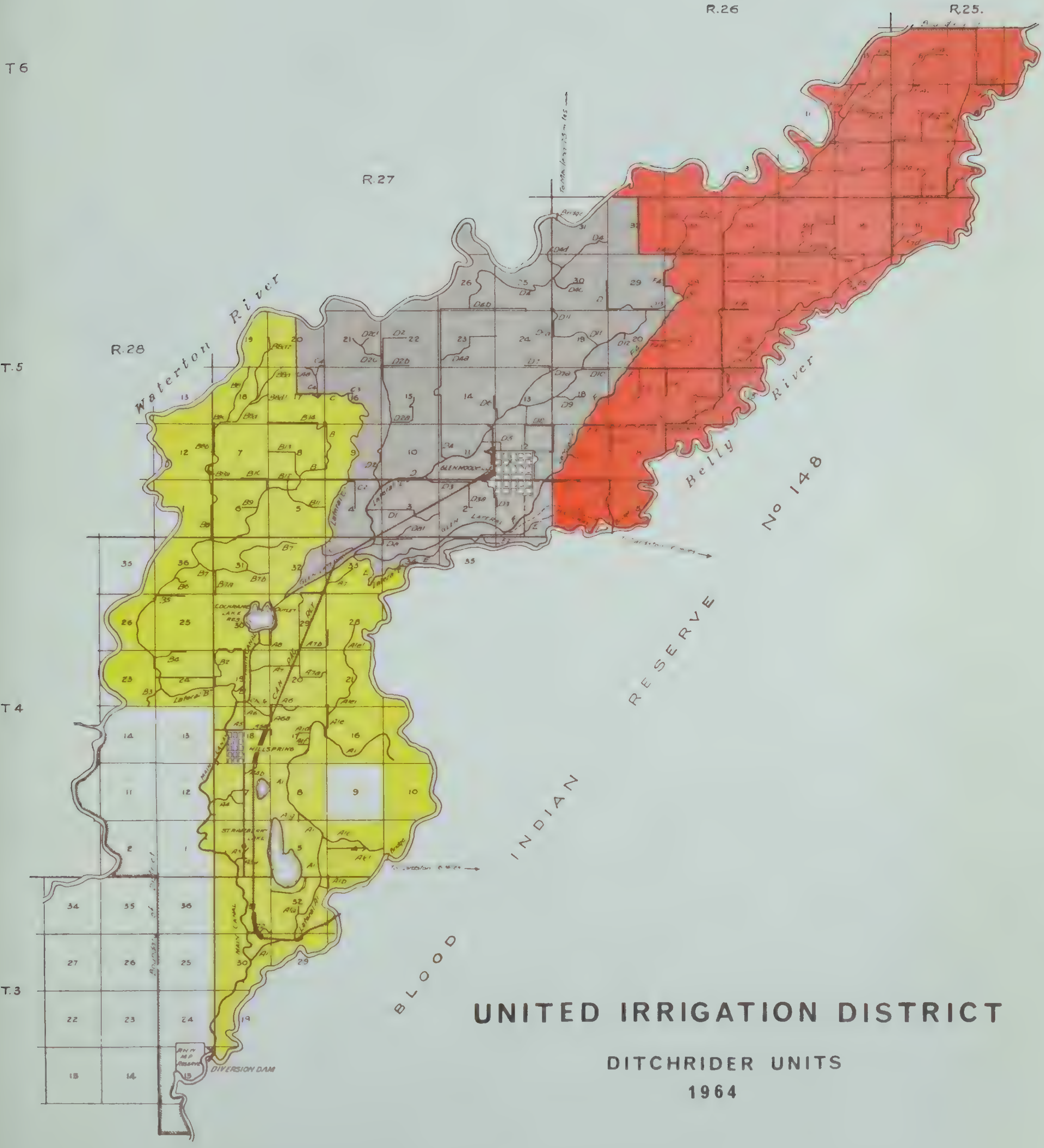
DITCHRIDER UNITS

1964



Prepared under the direction of P.L. [illegible] P.Eng
Director of Water Resources Edmonton, Alta 1963

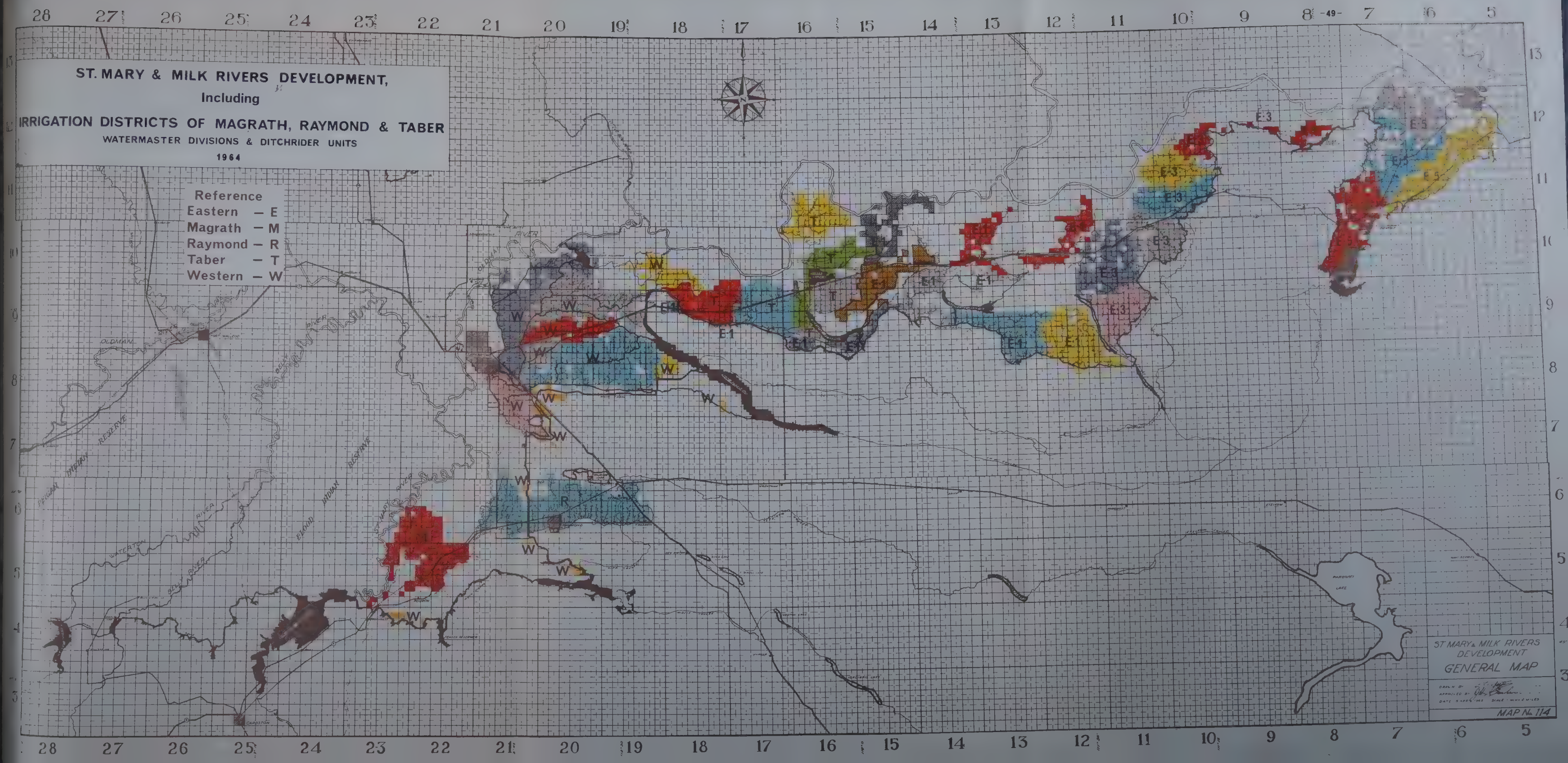




UNITED IRRIGATION DISTRICT

DITCHRIDER UNITS

1964


ST. MARY & MILK RIVERS DEVELOPMENT,
Including
IRRIGATION DISTRICTS OF MAGRATH, RAYMOND & TABER
WATERMASTER DIVISIONS & DITCHRIDER UNITS
1964

SECTION 1V

THE RELATIONSHIP BETWEEN CAPITAL OWNERSHIP, STRUCTURE, SIZE AND ECONOMIC EFFICIENCY

To develop these relationships for irrigation administrations, it may be worthwhile to look at economic theory to find a framework for analysis.

In business activity the growth in size of an organization, or firm, may result from many forces which are exerted upon it. The desire for economic security from severe competition will often cause firms to grow by purchasing controlling authority in other firms.[34] Internally, large firms may be able to adopt new technology because they have the resources to do so. Small firms would not have sufficient resources. The use of mass production principles is a case in point. Whatever the motivating force, the growth in ownership and thus controlling authority of capital is likely to lead to a corresponding growth in the structure of its associated organization. Exceptions appear where new technology is adopted and labor is replaced, or where there is direct duplication in the numbers of employees performing the same functions.

Economic efficiency is concerned with the ratio of output to input for the firm or plant. Plants with high output for a given amount of resources are said to be efficient. Economic efficiency is thus concerned with the cost of producing a service. In the short run, this means equating costs which are variable to fixed or overhead costs so that output per unit of input is at a least cost position.

The firm may control many plants which vary in size depending upon the market served. The plant is a physical quantity of land, labor and capital producing a product or service.

Turning to irrigation administrations in Southern Alberta, the following discussion can be developed. It has already been pointed out that capital ownership has determined the forms of administration. By analogy, the firm is the irrigation administration. The plant is a project; a combination of irrigation works, labor, equipment, and land. An irrigation district operates one plant. P.F.R.A. operates two plants. Alberta, through crown corporations and the Water Resources Branch is involved in operating three plants. The plants, whose controlling authority is vested with senior governments, appear to operate with considerable autonomy. Projects can be a part of a system or a whole system. In no case in Southern Alberta is there a firm which operates more than one complete system.

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[34] Galbraith, J.K. - "The Affluent Society".

The size of a system, as measured by irrigable acres, that is market area, is fixed by physical limitations. The number of irrigable acres is determined by the nature and property of the soils and the area that can be reached by gravity flow or pumping. Other limitations include the total supply of water that can be diverted and stored for use during the irrigation season and the ease with which the irrigable area can be drained.

Once a system has been designed and constructed its size may be limited further by the canals and structures incorporated into it. This design is fixed until the structures are replaced, which may be 50 to 100 years from the date of their original building.

Overcoming physical limitations encountered by engineers building systems in Southern Alberta has resulted in major structures such as the Bassano dam, the Brooks aquaduct, and Lake Newell in the E.I.D.; the long headworks, including the diversion weir at Carsland, the main canal, Lake McGregor and the Travers Reservoir in the B.R.P.; and the Waterton, St. Mary, Jensen and Ridge Reservoirs and their accompanying works in the S.M.R.D.

Table V shows various measurements of the size of project and their corresponding administration. Table VI groups administrations by system and gives their size.

In Table V, average assessed irrigable acreage is an indication of the quantity of service that an administration must be prepared to provide. Employees measure the amount of human resource involved in an administration. Gross diversion is an indication of the volume of the product transported and distributed. Total revenue is an indication of the volume of business transacted. Number of water users indicates the size of the clientelle served.

The administrations have been arranged from largest to smallest on the basis of their average assessed irrigable acreage. The other measurements of size tend to follow the same pattern. The variations may be in part explained with the following information.

Numbers of employees do not include foremen or laborers making up construction and maintenance crews. This may vary with the number of structures, the seasonal nature of the work, and the condition of the project. The S.M.R.D. has proportionately fewer employees because their Western Division does not service the farm quarter. In addition, any construction of new works on the S.M.R.D. in its Eastern Division and main canal is being carried out by the Water Resources Branch of the Alberta Department of Agriculture.[35] The B.R.P. has a relatively large number of employees because they are carrying out a rehabilitation and settlement function. The U.I.D. appears to have least cost as a major objective. Number of employees is minimal.

The gross diversion for the B.R.P. includes the supply for approximately 20,000 acres administered by the B.R.D.

Total revenue for the B.R.P. does not include revenue from the Federal Government. This point will be elaborated on later. The U.I.D. has a proportionately lower revenue than most administrations.

The number of water users varies with the size of farm which is in turn dependent upon the stage of development and the cropping program for each administration's area.

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[35] Expenditures for construction and extension have amounted to about $450,000 per year on the S.M.R.D. and $250,000 per year on the B.R.D. for the past 5 years. Source - Annual Returns of S.M.R.D. and B.R.D.

TABLE V

MEASUREMENTS OF PROJECT AND SYSTEM SIZE

Administration	Av. Assessed Irrigable Acreage 1960-64 36/	Employees Less Maintenance & Constr. Crews 1964 37/	Gross Diversion '000 Ac. Ft. 38/	Average Total Revenue $'000 39/	No. of Water Users 1964
E.I.D.	190,867	69	523	649	1,168
S.M.R.D.	183,531	49	348	522	1,447
B.R.P.	94,600	77	217	215	520
L.N.I.D.	90,654	31	135	232	786
W.I.D.	44,117	15	129	131	707
T.I.D.	34,860	9	68	108	350
U.I.D.	33,997	4	-	31	179
B.R.D.	20,656	8	-	53	174
R.I.D.	20,349	2	32	35	207
M.I.D.	7,884	1	15	23	125
A.I.D.	6,673	2	-	4	58
L.I.D.	4,503	2	-	6	65
M.V.I.D.	3,720	2	-	-	29
TOTAL	736,411				5,815

- No source readily available

36/ Irrigable acreage information for E.I.D., S.M.R.D., L.N.I.D., W.I.D., T.I.D., and U.I.D. were obtained from their financial statements. All other figures are derived from Annual Returns from Irrigation Districts to the Water Resources Branch of the Alberta Department of Agriculture.

37/ The A.I.D., L.I.D., and M.V.I.D. employees consist of part time personnel and include a secretary-treasurer and ditchrider.

38/ Gross diversion figures for S.M.R.D., T.I.D., R.I.D., and M.I.D. were obtained from 1961-64 Annual Reports from S.M.R.D. Other gross diversion figures were supplied from "Report on Return Flows from Irrigation Districts in Alberta" - Water Resources Branch, Department of Northern Affairs and Natural Resources.

39/ Figures for T.I.D., R.I.D., and M.I.D. are adjusted because a single entry record keeping system is used.

TABLE VI

IRRIGATION SYSTEMS AND CORRESPONDING ADMINISTRATIONS

SYSTEM	RIVER	ADMINISTRATIONS	ASSESSED IRRIGABLE ACREAGE	No. of WATER USERS
(1)	St. Mary	S.M.R.D. P.F.R.A., S.M.R.D., T.I.D., M.I.D., R.I.D.	246,624	2129
(2)	Bow	E.I.D.	190,867	1168
(3)	Bow	B.R.D., B.R.P.	115,256	694
(4)	Old Man	L.N.I.D.	90,654	786
(5)	Bow	W.I.D.	44,117	707
(6)	Waterton	U.I.D.	33,997	179
(7)	Belly	M.V.I.D., L.I.D., A.I.D., Water Resources Branch.	14,896	152

- -

For irrigation administrations, economic efficiency means providing a desired level of service with the least amount of resources possible, i.e. least cost per irrigable acre. As the period for change in the system and its design is at least 50 years, and often 100 years, for practical administrative purposes there will always be fixed costs.

The fixed costs of an administration can be described as those costs which remain constant for a system at any level of operation. Level of operation can be measured in terms of irrigable acreage served. Interest and depreciation on the works would be fixed costs for a system. A large structure such as a diversion weir, with a physical life of possibly 50 years, might cost $1,000,000. The annual cost for a fund to replace the weir in 50 years and return 5% on investment amounts to $55,000 on an amortized basis. If the weir is used for 55,000 irrigable acres the annual fixed cost per acre would be $1.00 per acre. 110,000 irrigable acres served by the weir would reduce the annual fixed cost to 50¢ per acre. Alternately, two systems could serve equal market areas with maximum efficiency and still have different fixed costs per irrigable acre because of the structures required.

Given a system to administer, management fits physical and human resources to it to provide a level of service to the water users who own the irrigable acreage or market. It thus becomes a case of being as efficient as possible in matching labor and some capital in the form of machines, supplies and materials to a larger quantity of fixed resources.

Under such circumstances, total costs per irrigable acre, which are the rates charged unless other sources of revenue are available, should be expected to vary between systems and parts of systems.

Table VII shows the proportions of resources used by various administrations to accomplish their own level of service. The information was calculated from the administrations' statements of Revenue and Expenditure or Receipts and Disbursements. Adjustments were made for deductions shown in Statements of Capital Surplus, Revenue Surplus, and Reserve for Replacement of Capital Assets. Capital expenditures on irrigation works were excluded. Adjustments were made as well to single entry records so that they would match as closely as possible those kept on the accrual basis.

Economic theory assumes divisibility of inputs or resources. For administrations with their present size this is not always possible. One accountant, given a compliment of clerks and accounting machines, may be sufficient to handle the accounts of many water users. On the average, irrigation administrations have one dragline for 40,000 acres.[40/] An engineer's services for design of replacement works in an established administration may only be required on a part time basis. A manager's services worth $10,000 a year is likely to be too costly for an irrigation administration serving 10,000 irrigable acres. A lawyer may also be too costly to retain on a salaried basis.

The normal recourse to such a problem is for an administration to retain such services on a part time basis. Lawyers are retained for the drafting of a regulation or the preparation of a court case. Engineers' services are purchased from outside agencies. Equipment is rented. The degree to which services can be retained and used is dependent on their availability. If

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[40/] Inventory records of Administrations.

TABLE VII

PERCENTAGE PROPORTIONS OF EXPENDITURE

For Nine Irrigation Administrations 5-Year Average 1960 - 1964

	E.I.D.	S.M.R.D.	L.N.I.D.	W.I.D.	T.I.D.	U.I.D.	B.R.D.	R.I.D.	M.I.D.
Salaries and Wages									
Under 30%								■	
30 to 50%	■	■		■	■	■	■		■
Over 50%			■						
General									
Under 15%	■	■	■	■	■	■	■	■	■
Equipment Expense									
Under 15%		■	■	■	■	■	■	■	■
15 to 30%	■								
Transportation Expense									
Under 15%	■	■	■	■	■	■	■	*	*
Materials and Supplies									
Under 15%	■	■	■		■		■		■
15 to 30%						■		■	
Over 30%				■					
Depreciation on Equipment									
Under 10%	■	■	■	■		■	■		**
Water Supply Charge									
15 to 30%		■			■		■		
30 to 45%								■	■

* -Included elsewhere - inseparable.

** -No depreciation expense charged. Reserve set up.

these resources are not available in the required quantities, the level of service desired may be forgone.

In terms of managerial decisions on economic efficiency, there is likely to be a strong incentive to develop the irrigable acreage within a system to its maximum. The E.I.D., as an example, has expanded its irrigable acreage from about 90,000 acres in 1935 [41] to 193,381 assessed irrigable acres in 1964. This has been accomplished in part by adding small quantities of capital for construction to a large sunken investment. Capital invested by the C.P.R. from 1912 to 1933 amounted to over 12 million dollars. Since that time about $1,200,000 has been invested.[42] Incentive to increase irrigable acreage may also result from the knowledge that with a larger acreage to service, resources which would have to be obtained by contract and rental can be now owned eliminating the problem of availability.

In discussing level of operation i.e. number of irrigable acres served, there is one point worthy of note. Once a level of operation has been reached it is unlikely that it will be decreased. As administrations charge through taxation procedures, they will be reluctant to relinquish the revenue gained. In established irrigation administrations, the water user who has adjusted to an irrigated cropping program will be reluctant to relinquish his right to use the water. Level of operation, thus may be difficult to reduce. Costs for operation staff, labor, equipment, materials and supplies would tend to be fixed as any increased level of operation is reached.

The relationship between costs per irrigable acre and the distribution of irrigable land is developed in Table VIII. This Table shows the average amount of irrigable acreage found on a quarter of land. The quarters within a system which had no assessed irrigable land on them were excluded. The total cost of providing a service per irrigable acre is likely to rise proportionately with less irrigable acreage on a quarter, assuming the same level of service and assuming away differences in costs due the physical works of the system.

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[41] The History of the Eastern Irrigation District 1960.

[42] No adjustment has been made for changes in dollar value due to inflation or deflation. Annual Returns, Water Resources Branch.

TABLE VIII

DENSITY OF IRRIGABLE ACREAGE

For Selected Administrations [43]

Administration	Average Total Assessed Irrigable Acreage 1960-64	Estimated [44] Acreage by Quarters	Density In %
S.M.R.D. Western Division	78,754	112,640	70
L.N.I.D.	90,654	146,720	62
E.I.D.	190,867	352,960	54
S.M.R.D. Eastern Division	104,777	217,760	48
B.R.D.	20,656	63,840	32
W.I.D.	44,117	167,200	26

- -

In summary, in the past it has been mainly capital ownership that has determined the controlling authority of a project. The size of organizational structure, measured in numbers of employees is dependent upon the physical size of the project or system. Economic efficiency depends upon the level of service desired and the resources used. The size of the system is fixed for long periods of time by its design and eventually by the number of irrigable acres it can service. For present administrations, economic efficiency means equating labor and materials to the fixed resource i.e. the system. In this regard there is likely to be strong impetus to develop all possible irrigable acreage. Comparisons between systems using expenditure per irrigable acre as a criterion are erroneous unless the level of service, the fixed size of the system and the variability in works are taken into account.

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[43] Density of Irrigable Land = Average Total Assessed Irrigable Acreage ÷ Estimated acreage by Quarters.

[44] Estimated Acreage by Quarters = Number of Quarters on Assessment x 160.

SECTION V

APPARENT PROBLEMS IN ADMINISTRATION

There are a number of problems facing irrigation administrators which may be of interest to policy makers. The following are tendered for consideration. They are not listed in any order of priority, but appear here as additional information on administrative procedure.

LEVEL OF SERVICE

Administrations are faced with the problem of evaluating the level of service desired by the water user and relating this to his ability to pay for it.

Service industries operating under conditions of private enterprise can use the price system to measure the level of service desired. If the cost of providing a level of service is too high in relation to the consumer's income, the consumer will purchase an alternative, a substitute or not buy at all.

For irrigation administrations, the need for a level of service can only be related to the "expressed" satisfaction or dissatisfaction of the water users once a project has been constructed. Taxation procedures preclude the use of the price system as an indicator. Periodic cost studies and general statistics are all that is available to use as a guide to determine the water users ability to pay.

The ability to pay for a maximum level of service may be reflected in very general terms by the physical relationships between climate and the cropping program of the area served by an administration. To show the variation in growing degree days, length of frost free period and precipitation, Maps on pages 61, 62 and 63 have been reproduced. Table IX shows the variation in land use.

The greater the variation in rainfall and the lower the mean precipitation for the growing season, the more need for irrigation for all types of crops. The hotter the climate and the longer the growing season, the wider is the diversity of crops that can be grown.

In the western regions rainfall is higher, temperature is lower, and the frost free period is shorter. Forage is a major irrigated crop. The further east one moves towards Medicine Hat, the lower the precipitation, the higher the temperature and the longer the frost free period. The variety of crops grown, including specialty crops, increases.

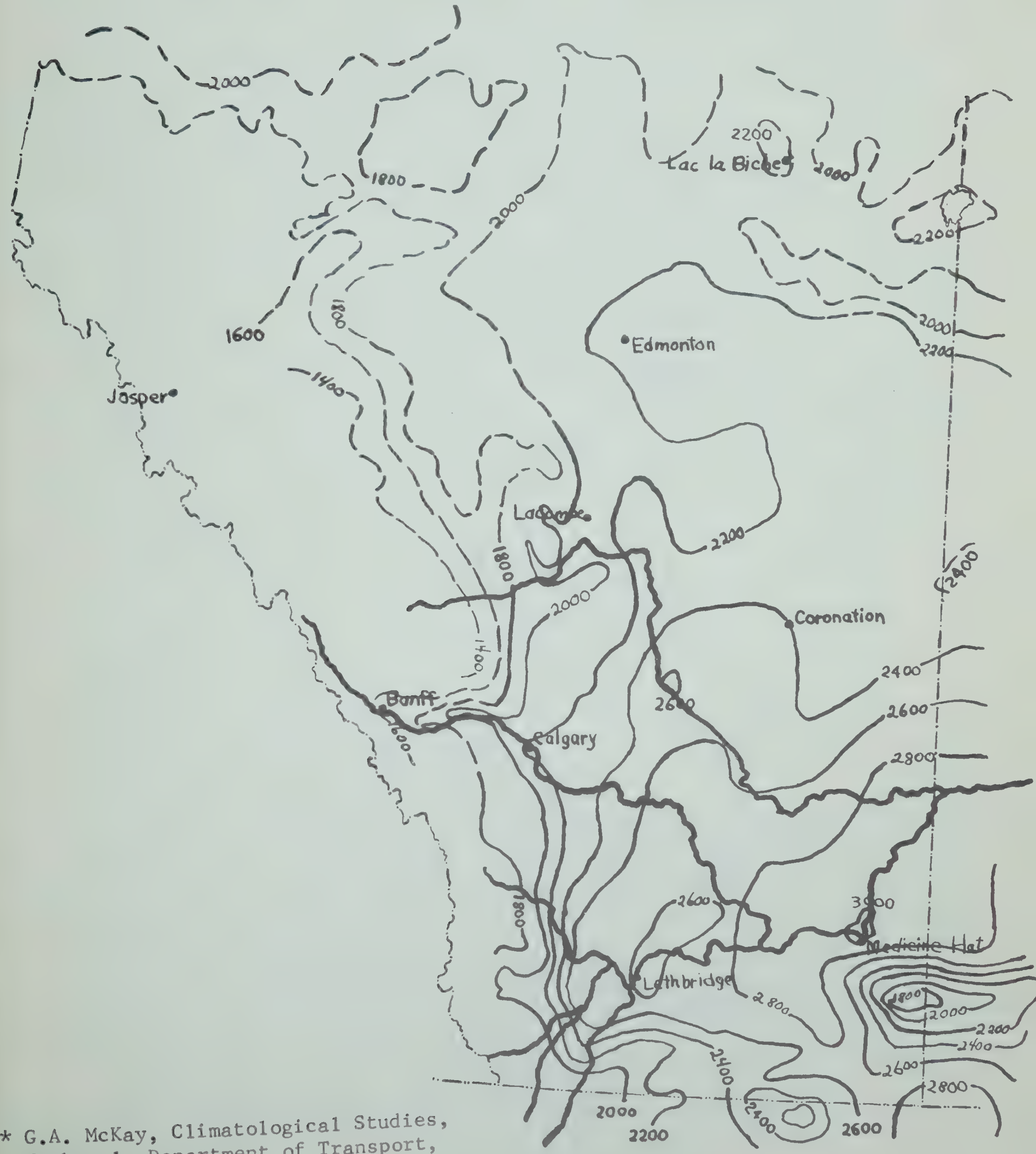
The level of service desired and the ability to pay for it is likely to be higher for a high revenue producing speciality crop than that for a supplementary forage crop.

It can be noted that the administrations which have some of the lowest rates and lightest compliments of staff are located in south western Alberta. Their water users produce mainly forage. They include M.V.I.D., L.I.D., A.I.D., U.I.D. and W.I.D.

MEAN ANNUAL NUMBER OF DEGREE-DAYS ABOVE 42°F

From May 1 - Sept. 30

For Southern Alberta *



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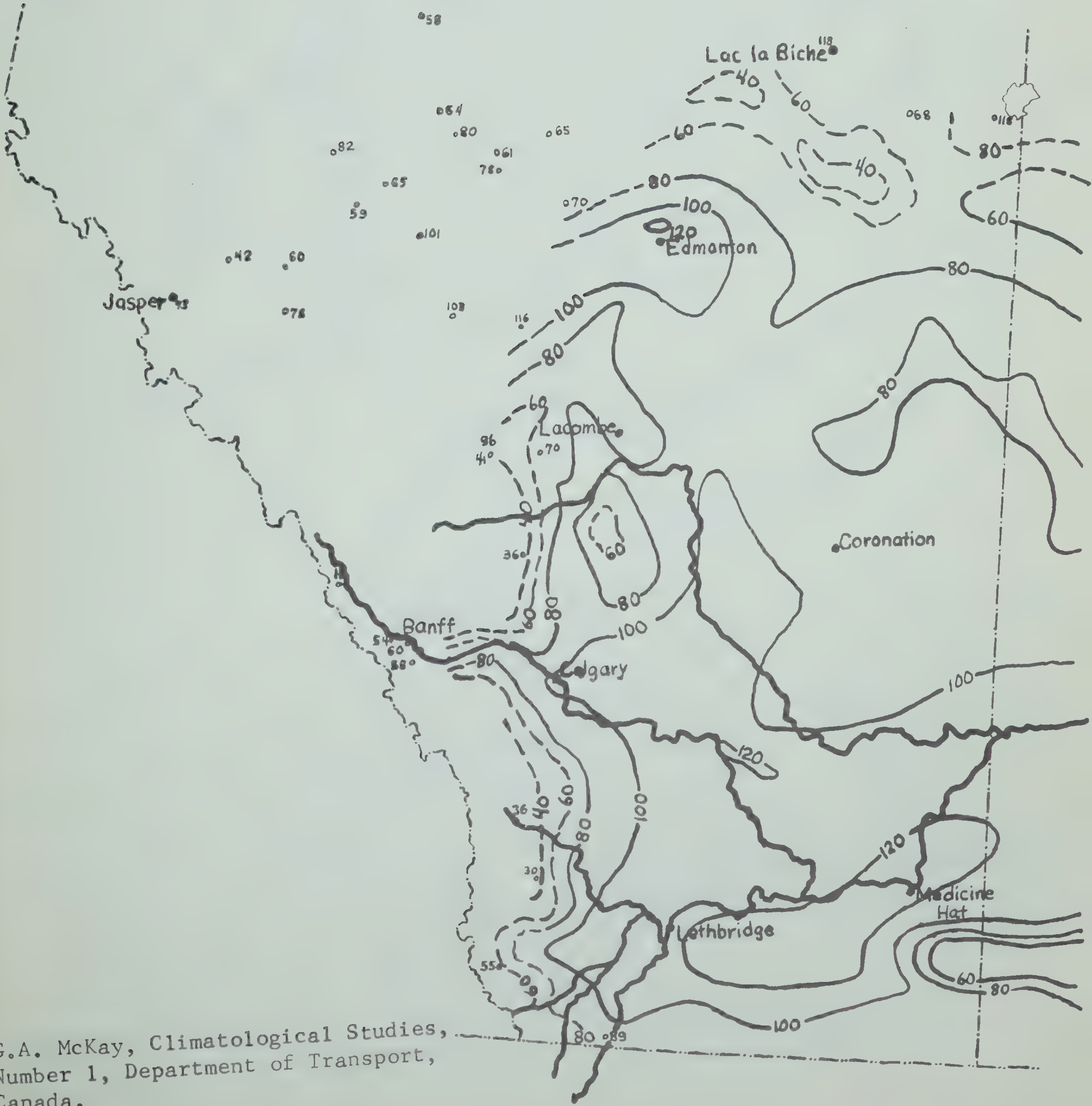
* G.A. McKay, Climatological Studies, Number 1, Department of Transport, Canada.

MEAN ANNUAL LENGTH OF FROST FREE PERIOD DAYS

For Southern Alberta *



* G.A. McKay, Climatological Studies, Number 1, Department of Transport, Canada.

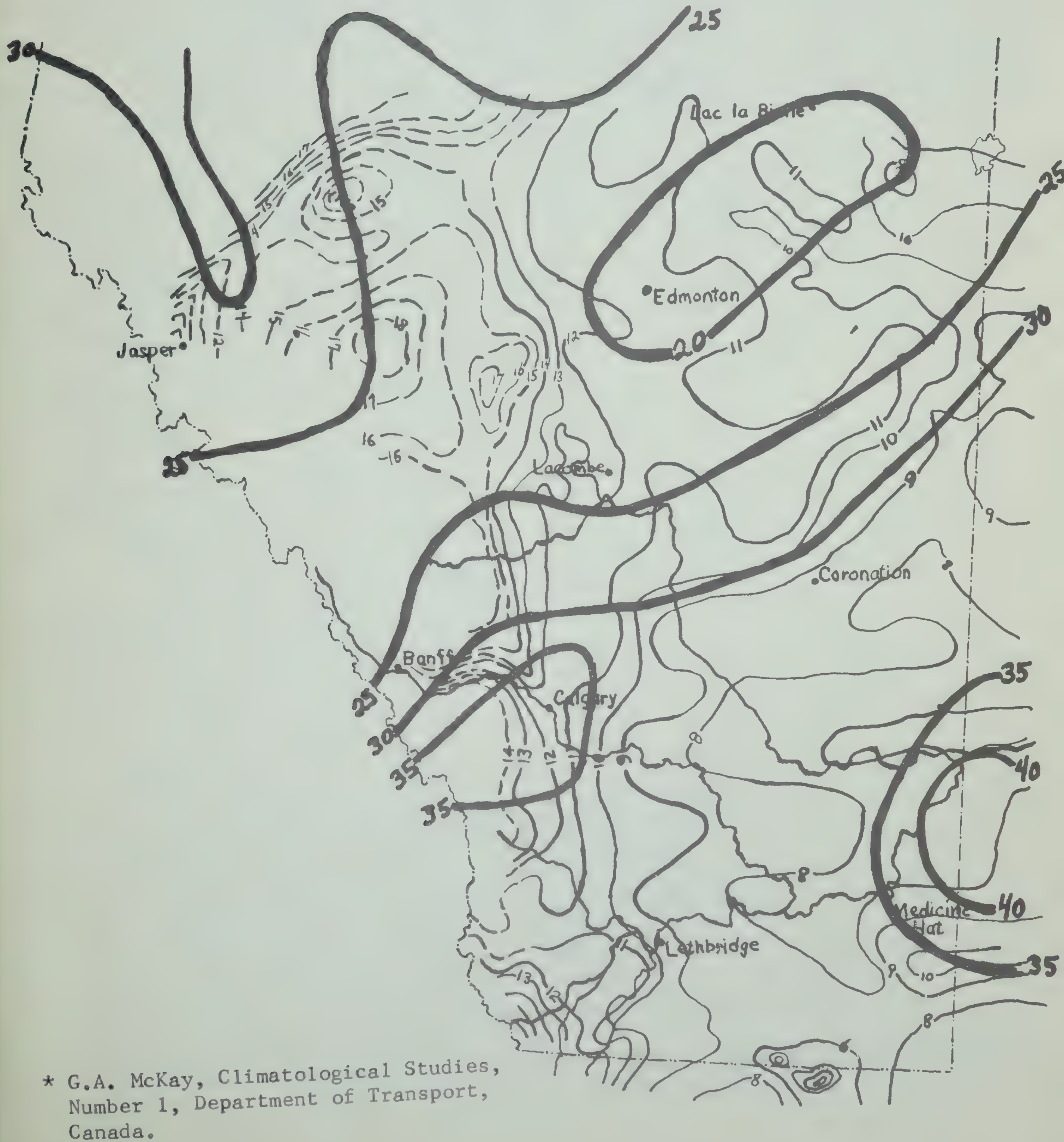
MEAN AMOUNT OF PRECIPITATION

From May 1 - Sept. 30 (inches)

and

COEFFICIENT OF VARIATION OF GROWING SEASON PRECIPITATION

For Southern Alberta*



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* G.A. McKay, Climatological Studies, Number 1, Department of Transport, Canada.

TABLE IX

APPROXIMATE LAND USE, IRRIGATED LAND BY REGION, ALBERTA.[45]

Region	I	II	III	IV	V
	Western Irrigation District	Eastern & Bow River Projects	Ross Creek & eastern portion of S.M.R.D.	Taber, Raymond, L.N.I.D. & western portion of the S.M.R.D.	Magrath, United, Leavitt, Aetna, Mountain View, & area surrounding Blood Reserve
			- percent -		
Wheat	2	16	20	21	1
Feed Grains	4	24	16	18	4
All Grain	6	40	36	39	5
All Forages	91	39	35	24	86
Oilseeds	--	6	14	7	--
Specialty Crops	1	4	6	27	6
Other Crops	--	1	2	2	2
Summerfallow	2	10	7	1	1
TOTAL	100	100	100	100	100
Cash Crops	3	26	40	55	7
Feed Crops	95	64	53	44	92
No Crop	2	10	7	1	1
TOTAL	100	100	100	100	100
Sprinkler	10	1	10	13	9
Flood	90	99	90	87	91
ALL	100	100	100	100	100

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[45] Source:- K. Elgaard, Economics Branch, Canada Department of Agriculture per proceedings Irrigation Economics Conference, June 10, 1964.

COMPARISON BETWEEN ADMINISTRATIONS

As shown, there are fifteen administrations with a common general objective of water transportation and distribution.

With today's rapid communications, these administrations may often be compared by both water users and irrigation personnel. Common criterion for comparisons may be the water rate, the kind and level of service, the salaries and wages paid to personnel and the level of maintenance. Superficial comparisons can be very misleading unless a great many variables are standardized.

Table X shows the variation in rates between administrations in 1964.

The water rates are subject to downward or hold-the-line pressures from water users. Increasing costs of labor, material and supplies[46/] over the years have put pressure on management to raise rates. Comparisons between administrations have put pressure on those with high rates to keep them in line with low rates. These pressures have been reduced where administrations have diversified their sources of revenue.

Table XI shows the variation in sources of revenue for seven administrations. Rates need to be evaluated in relation to total revenue. Unless this is done, an administration deriving its total revenue solely from rates may be put in the impossible position of providing a higher level of service with less resources.

The Bow River Project is not included in Table XI because its accounting system is very different. This much can be pointed out. The percentage that water charges make up of this administration's total expenditures for project investment, operation and maintenance is approximately nine per cent. Another nine per cent comes from other sources on the project.[47/]

The W.I.D. and the E.I.D. have large revenues from land earnings and interest on investments. The E.I.D. derives revenues from grazing leases which are available only to water users of the district. The custom work earnings of some administrations may indicate additional service or excess capacity.

Rate comparisons are thus no indication of the relative efficiency of administrations, yet they remain a problem for administrators.

[46/] Canada Department of Agriculture, P.F.R.A. "Annual Cost of the E.I.D." 1965.

[47/] Annual Returns to Water Resources Branch, Alberta Department of Agriculture and P.F.R.A. Vauxhall. 5-Year average 1960-64.

TABLE X

VARIATION IN IRRIGATION RATES 1964 [48]

Administration	$ Assessed Per Irrigable Acre	Administration	$ Assessed Per Irrigable Acre
S.M.R.D. Eastern	3.00	W.I.D.	1.50
L.N.I.D.	2.50	B.R.P	1.50
M.I.D.	2.50	L.I.D.	1.25
T.I.D.	2.50	R.I.D.	1.00
E.I.D.	2.50	U.I.D.	.90
B.R.D.	2.35	M.V.I.D.	.50
S.M.R.D. Western	2.25	A.I.D.	.50

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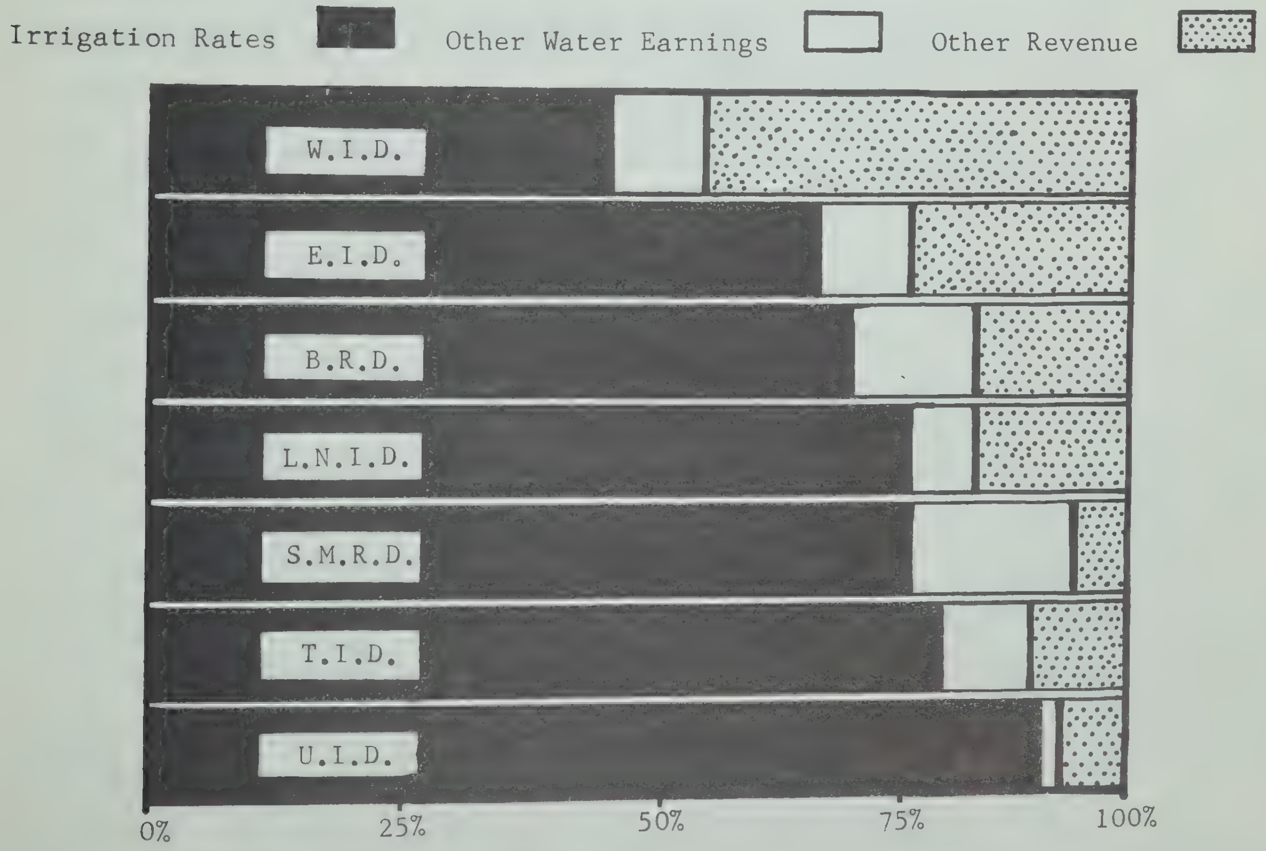
[48] Annual Statistics Water Resources Branch, Alberta Department of Agriculture.

TABLE XI

SOURCES OF REVENUE *

For 7 Selected Irrigation Districts



* Revenue does not include Government grants or funds derived from sale of Capital Assets.

CAPITAL

Administrations have a problem in obtaining capital for rehabilitation and extension. No large reserves are available specifically for this purpose. In the past, capital has often been provided from sources other than the water users such as private industry or government. Present capital in the form of bonds held by administrations appears frozen. The interest from this capital has been used as revenue and is now built into the income and cost structure of the administration. Using these reserves will mean an increase in the water rate to cover operating costs. If water users are unable to pay a rate sufficient to cover all costs, the raising of capital for rehabilitation to maintain present services becomes a major problem.

PROVINCIAL LEGISLATION AND ORGANIZATION

Irrigation administrations are presently operating under various acts.[49/] They are affected, as well, by legislation and regulation of other acts including the Highways Act, the Alberta Labor Act, the Public Health Act and the Noxious Weeds Act. Under such circumstances negotiation, consultation, and agreement is necessary with the various departments and organizations concerned. For example, in carrying out the control of weeds, chemicals may be used on ditch banks or in the ditch itself. The Public Health Act requires a permit to do so.

At the provincial level, the responsibility for administering the Irrigation Districts Act, the Water Resources Act, and the St. Mary and Milk Rivers and Bow River Development Acts lies with the Minister of Agriculture. Many problems in irrigation administration are made known to the Minister by direct representation.[50/] These may be referred to their respective committees e.g. the Drainage Committee, the Irrigation Policy Committee, the Irrigation Planning Board and the Cabinet Committee on Irrigation. The Water Resources Branch and Colonization Branch of the Alberta Department of Agriculture which have been consolidated, handle various phases of legisla-

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[49/] See Section I - Page 5.

[50/] Minutes of policy groups of Irrigation Administrations.

tion, administration, regulation, construction and extension.

There is no civil service body with sole responsibility for co-ordination and resolution of problems of irrigation administrations. The agencies and people involved with committees are performing this function in conjunction with their regular duties.

Under such legislative and organizational framework, irrigation administrations may have difficulty in directing specific requests to the proper agency or committee and in reconciling other Acts to their own functions.

LABOR USE AND EMPLOYMENT

Irrigation administrations' labor requirements appear to be seasonal. They are similar to construction businesses in this regard. By law, the irrigation season extends from May 1st to September 30th.[51/] Water is diverted and flows over a longer period as shown in Table XII. This period requires a constant supply of operation personnel for water regulation and delivery. Adjustments are being made continuously as requirements are made known. The graph on Page 70 shows the variation in quantity diverted for the E.I.D. for 1961.

Preparations for the operating season begin in the early spring. Structures may need repair due to frost heaving. Canals require flushing. A program of cleaning small ditches is carried out with back-hoes, ditchers, and hand labor in areas inaccessible to machines. During the summer maintenance is continued. Draglines operate steadily on cleaning large canals and drains. Bridge floors may be replaced. As soon as the water is shut off in the fall and the frost sets in, a large amount of this labor force becomes available for other purposes.

Administrations have used various methods to overcome this slack work period. These include the construction of structures 'in place' during the winter; the precasting of structures for spring placement; the repair of machinery and buildings for next year's operation; the use of land and labor to look after livestock; and the laying off of employees until spring.

[51/] Regulations under the Water Resources Act 1958, Queen's Printer.

If permanent employment is a desired end, a technology to adapt labor to serve off season needs is important for administrations. The use of labor for endeavors such as farming may be more competitive than complimentary with summer needs. Winter construction appears to offer a solution.

Along with the use of seasonal labor is the concern for future labor supplies. As labor mobility increases due to increasing educational levels, and thus increased employment opportunities, irrigation administrations may find that they have to become even more competitive both in terms of wages and employee benefits. At present most administrations are providing unemployment insurance, a pension or annuity program and a service for medical deductions. As well, depending on the administration and the locality, personnel have been provided with housing on a rental basis.

Unless technology allows for a reduction in the amount of labor used, increases in wages of personnel will be reflected in the water rate. Administrations who face the problem of holding down rates as long as water users are subjected to a cost-price squeeze, have to hold down wage rates

TABLE XII

AVERAGE OPERATIONAL PERIOD

For Selected Irrigation Administrations

5-Year Average 1960-64

Administration	Opening Date	Closing Date	Operational Period
E.I.D.	April 29	Oct. 22	177
L.N.I.D.	April 23	Nov. 3	194
S.M.R.D. Western	May 3	Oct. 20	171
T.I.D. at Chin	May 12	Oct. 27	169
S.M.R.D. Eastern	May 2	Oct. 23	175
M.I.D.	May 7	Oct. 26	173
R.I.D.	May 16	Oct. 29	166
W.I.D.[52]	May 1	Oct. 15	168

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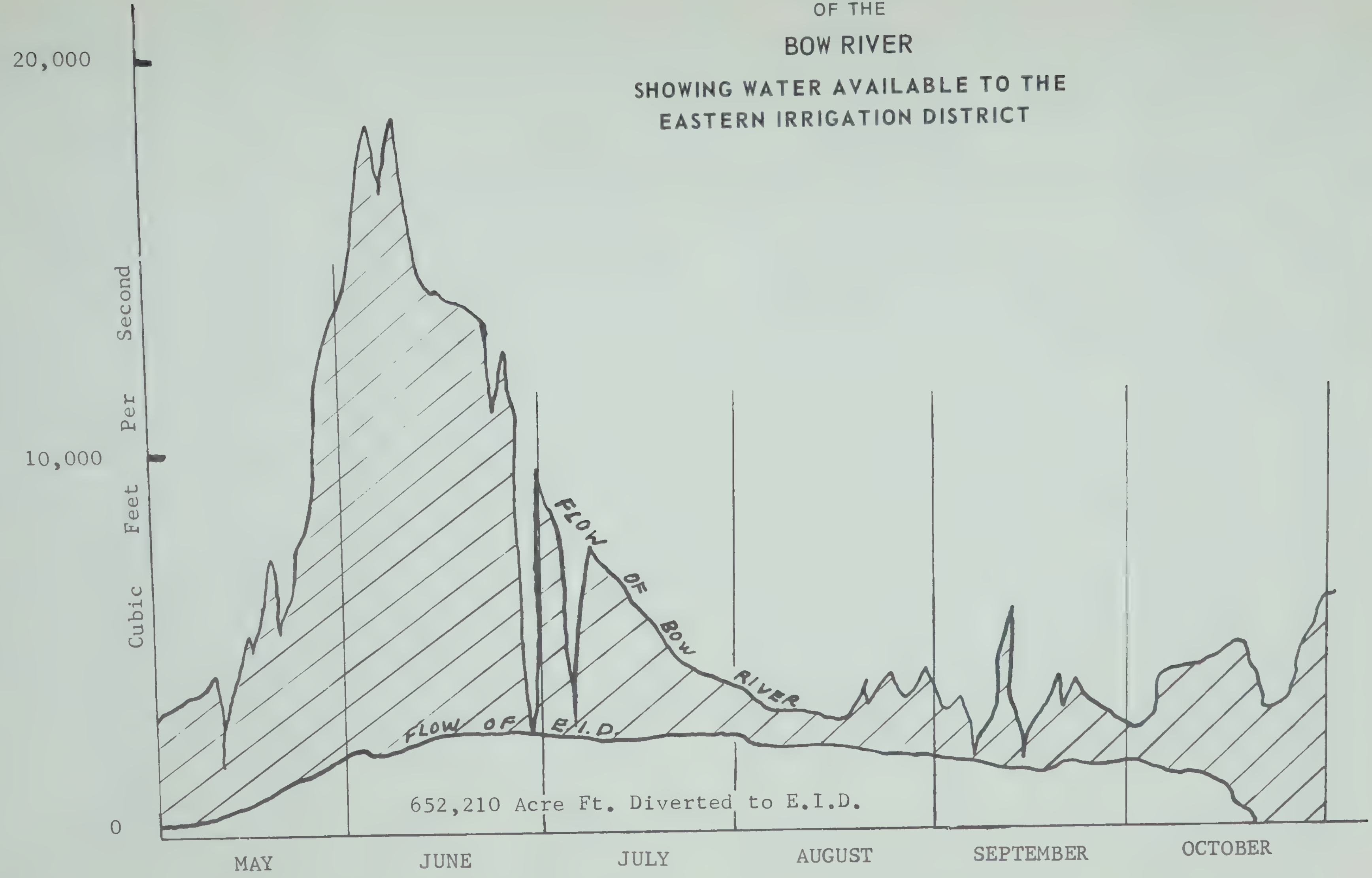
[52] Two-year Average 1963-64.

1961
HYDROGRAPH
OF THE
BOW RIVER
SHOWING WATER AVAILABLE TO THE EASTERN IRRIGATION DISTRICT



MEASUREMENTS BY DOMINION OF CANADA
WATER RESOURCES BRANCH

or cut back in other expenditures proportionate to any wage increase given. The consequence of low wage rates may be rapid labor turnover as employees turn to other employment offering higher remuneration. Technology to increase labor productivity appears to be difficult to incorporate without increased investment, the sources of which are limited. Under these conditions, obtaining future labor supplies may become a major problem for irrigation administrators.

COLLECTIONS

Three basic types of incentives for payment of accounts are in operation. Two methods are laid out under the Irrigation Districts Act.[53] Penalties are calculated on unpaid accounts at 2% after December 31st of the year of billing, 2% after March 31st, and 4% after June 30th. Penalties may also be charged on a straight six per cent per annum from May 1st of the year of billing.

A third incentive is the use of a discount. The exact type varies between administrations.

In an effort to see if there was a correlation between accounts receivable and the various incentives offered, Table XIII was prepared. From this Table it can be seen that factors other than the type of penalty and discount used must be more important. These may include the existence of cash crops such as sugar beets, the reluctance to follow through with rate enforcement proceedings, and the periodic shortage of operating capital of the water users. It can be argued that using no discount and a 6% penalty only provides working capital for the water user. There is little incentive for payment prior to going on rate enforcement.

The B.R.P. is unique among the administrations in that they have no provision for rate enforcement proceedings. Their only resort is to shut off the water.

It appears that some administrations are carrying heavy accounts receivable and that incentives alone in the form of discounts and penalties are not sufficient to overcome this problem.

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[53] Irrigation Districts Act, R.S.A. Part IV - Recovery of Rates, Page 51.

TABLE XIII

THE EFFECT OF INCENTIVES ON WATER RATES AND CHARGES RECEIVABLE

For 7 Irrigation Administrations

Administration	Incentive	% Outstanding[54]
S.M.R.D.	6% Penalty	61.1
L.N.I.D.	"	16.0
B.R.D.	"	70.7
W.I.D.	2-2-4% Penalty	71.7
U.I.D.	2-2-4% Penalty plus Discount	49.9
T.I.D.	"	18.3
E.I.D.	"	55.9

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[54] 5-Year Average, 1960-64. $\frac{\text{Water Rates and Charges Receivable}}{\text{Total Water Earnings}} \times 100 = \%$.

WATER RIGHTS

The right to divert water is controlled by the Province and administered through the Water Resources Branch of the Alberta Department of Agriculture. Administrations are licensed to divert specified quantities of water from a stream or river during flood, high water, and low water stages. Final licenses for water diversion have been issued to the E.I.D., the L.N.I.D., the W.I.D., and the U.I.D.[55]

For administrations lacking these licenses the guarantee of water for their water users is of concern. They fall in the category of multiple administrations on a single irrigation system and of still developing projects. The need for some system whereby present water supplies can be guaranteed is important to them.

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[55] Water Resources Branch, Alberta Department of Agriculture.

SECTION VI

CONCLUSIONS AND RECOMMENDATIONS

Any discussion of the kind of administration will depend on the degree of local autonomy and the available financial resources. The degree of local autonomy granted irrigation administrations is a major decision of policy makers[56/] at a provincial level because it is here that the enabling legislation is made. This autonomy is related to the funds which senior governments provide local administrations. The degree of autonomy granted is left to the policy makers to decide. It does affect the conclusions and recommendations of this study for the more autonomy that is granted administrations, the more the conclusions and recommendations of this study become suggestions for co-operation between administrations. Nor is the present problem of inequality of financial resources between administrations within the scope of this study. However, it can be pointed out that resolving this problem is likely to iron out difficulties created by comparisons between administrations on the kind and level of service provided and the rates charged.

Although recommendations are made from an administrative point of view, it is recognized that policy makers may have other considerations which may modify these recommendations. A generalization seldom fits a specific problem in its entirety. Through discussion of these recommendations, factors not considered may take precedence.

SIZE OF THE CONTROLLING AUTHORITY

The structure of administration is dependent on the area that a single authority controls. This area is measured in assessed irrigable acres. Before conclusions on structure can be made, the problem of size must be settled.

THE CONTROLLING AUTHORITY OF AN ADMINISTRATION SHOULD CORRESPOND IN PRINCIPLE TO AN IRRIGATION SYSTEM.[57/]

[56/] Policy makers include the Irrigation Policy Committee, the Cabinet and the Legislative Assembly.

[57/] A system has been defined earlier for the purpose of this report as all works necessary, to carry water from the point of diversion on a river to the farmer's land and to drain any excess back into a river.

This recommendation is based on the following reasons. It has been noted that cropping programs vary between systems. The potential income to provide for payment of rates for a specific level of service thus will vary with the cropping program. Cropping programs have the greatest similarity within systems. All the functions necessary to carry out water transportation and distribution are carried out within a system. Separation of the controlling authority within a system means a separation in these functions. The engineering design of a constructed system fixes both the capacity of the works and the irrigable acreage served for long periods of time. Economic efficiency means matching labor and supplies to the present works of a system. Duplication of personnel will be at a minimum, if the structure of organization is related to a system. As well, the necessity for committee work, negotiation on water requirements, resolving of rate differences and revenue surpluses will be minimal. Construction and maintenance standards will be uniform throughout.

STRUCTURE OF ADMINISTRATION

The structure of administration varies with the size of system. A logical expectation will be variations in numbers of employees and thus in the number of administrative levels. In all cases, a policy level and an employee level are required. The management and supervisory levels may be superimposed downward on the employee level if the system is very small. Under present conditions, the maximum number of levels required with larger districts would appear to be four.

POLICY MAKING LEVEL

A BOARD OF TRUSTEES SHOULD BE THE BASIC POLICY MAKING UNIT.

Reasons for this recommendation are as follows. With a Board, decisions on policy can be made by all representative interests. The Board allows flexibility in establishing these interests. Decisions on policy by a Board are made through group participation and close to the problems at hand. A Board provides for continuity of policy through a system of rotational election or appointment. A Board allows for separation of local and provincial interests or a combination of both.

The financial interests which require representation under present conditions are the water users served by the administration and the governments who provide funds for investment, operation and maintenance.[58] The water users should have representation because they supply funds through taxation measures. As long as they are located within the boundaries of an irrigation administration, they have no choice but to pay the rates they are assessed.

There appear to be two alternatives for composition of a Board which has been composed of 3, 5 or 7 members. Representation on the Board may be made up of elected representatives of the water users subject to regulation by the senior governments providing the funds. The regulation may vary from a specified level of service with no charges on funds used or no regulation and a straight interest charge on funds borrowed. The other alternative is to provide for proportional representation on the basis of the funds provided for investment, operation and maintenance. For example, if water users provided 60% of the funds, they would elect three members to a five man Board. Senior governments would appoint two.

MANAGERIAL LEVEL

THE BASIC MANAGERIAL UNIT SHOULD BE A MANAGER WHO HAS BEEN DELEGATED THE AUTHORITY AND RESPONSIBILITY TO CARRY OUT THE POLICIES OF THE BOARD.

The advantages of having one man designated as manager are that he can be knowledgeable in, and can co-ordinate all aspects of administration. He can make decisions without continual consultation and qualification. He is available on a continuing full time basis. He is accountable to the Board for all actions of the administration.

It is recognized that the kinds of decisions and thus the managerial ability required will vary with the size of system. Still, one man accountable to the Board, who usually meet once a month, is a strong form of organization and seems most desirable for an irrigation administration.

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[58] This assumes that irrigation administration are unable to pay for finances through private investment channels with revenues derived from water users.

SUPERVISORY AND EMPLOYEE LEVELS

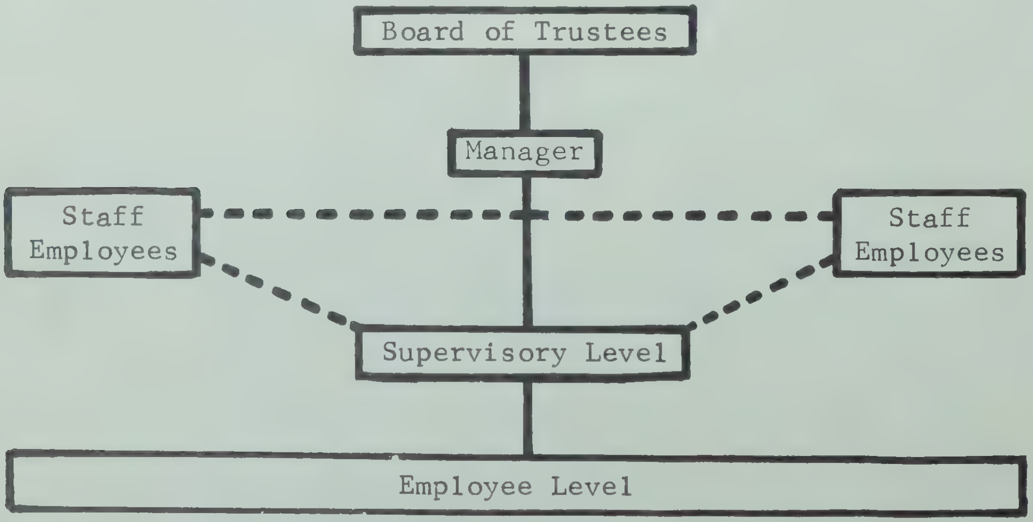
With change in size of administration, the number and kind of levels of supervisors and employees will vary. The watermaster and ditchrider are the basic operational units. With the multitude of variables which must be considered at these levels, it is recommended that THE MANAGEMENT OF ANY SYSTEM SHOULD BE FREE TO DEVELOP AND EQUATE THEIR LABOR SUPPLIES TO THEIR OWN CONDITIONS. In so doing, management must be cognizant of the policies decided upon by the Board which may include the basic premise of economic efficiency. Guidelines presented in this report may be useful in this regard.

LINE AND STAFF ORGANIZATION

THE DIFFERENCE BETWEEN LINE AUTHORITY AND STAFF AUTHORITY SHOULD BE RECOGNIZED IN PRINCIPLE IN ESTABLISHING IRRIGATION ADMINISTRATIONS.

This recommendation is based on the following reasons. The number of levels of administration can be reduced. The distance between the manager and his employees is shorter which is a desirable situation. Management can be made aware of the problems which occur at the ground level without the need of transferring this information through a number of supervisory levels.

Such functions as accounting, personnel, research, and engineering appear to be staff functions. They are advisory in nature. In terms of structure, they can be charted in the following manner.



The Secretary and Treasurer's duties as developed in the Irrigation Districts Act appear to be largely a staff function.

CONTRACTED OR HIRED SERVICES

THE JOINT USE OF CONTRACTED OR HIRED SERVICES BY ALL ADMINISTRATIONS SHOULD BE ENCOURAGED AND MADE AVAILABLE TO ALL THAT HAVE NEED FOR IT.[59/]

Services required by irrigation administrations such as research, construction of large extensions[60/], advice and work on legal matters are likely to remain on a contractual basis. As irrigation is a specialized field and requires special knowledge, there are advantages in having an external firm or organization available for consultation. The more often specialists are used, the greater wealth of experience they have. While all administrations may not be involved in major rehabilitation at any one time, over a longer period, they all have to replace structures. Research into new technology may result in savings for all administrations.

Examples of pooling in the past include the co-operative retention of a law firm, and the use of Water Resources and P.F.R.A. engineers.

STANDARDIZATION

ACCOUNTING PROCEDURES SHOULD BE STANDARDIZED.

At present, because of local autonomy, accounting procedures, job descriptions and salaries are often different between administrations. For policy making at a provincial level, making an equal policy for all administrations with different methods for record keeping is difficult. Standardized accounts would provide the basis for provision of funds if so desired by senior governments. It is suggested that a more uniform description of duties of employees would result in a larger labor pool for all administrations and

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[59/] This recommendation is basically extension of existing services used by irrigation administrations at present on an equal basis for all.

[60/] The need for co-ordination between engineers concerned with operation and maintenance and those concerned with construction can be supported. Construction at least cost may not be always compatible with operation and maintenance at least cost.

would provide a greater training ground for new employees, i.e. A ditchrider might obtain a job as a watermaster with another administration.

LEGISLATION

CONSOLIDATION OF LEGISLATION ON ALL IRRIGATION ACTS IS NEEDED.

This would provide for one act for all administrations, eliminating any problems of correlating their administrative procedures to two or three acts.

PROVINCIAL CO-ORDINATION

THERE SHOULD BE ONE DESIGNATED PROVINCIAL BODY THROUGH WHICH ALL PROBLEMS OF ADMINISTRATIONS CAN BE CHANNELED.

In this way, irrigation administrations will be able to approach the same person or people for all problems. This body could funnel requests and problems to the various committees, or departments involved on a co-ordinated basis.

FUTURE RESEARCH

CONSIDERATION SHOULD BE GIVEN TO CONTINUING STUDY AND RESEARCH TO DEVELOP NEW TECHNOLOGY.

Technology has been the key to expanded output in the modern day. Possibilities for research into new methods of water delivery, construction and maintenance will help irrigation administrations to hold the line on costs. With the quantity of capital which must be invested in irrigation, expenditures on research can provide valuable benefits. The use of the earth-fill dam is an example.

Research on a continuing basis to show the water users ability to pay would be helpful in providing administrations with information to establish the level of service the water users can afford and thus the rates for their administration.

APPENDIX 1

MEASURES OF SIZE AND EFFICIENCY OF IRRIGATION ADMINISTRATIONS

MEASURES OF SIZE AND EFFICIENCY

Irrigation Administration	TOTAL	EID	SMRD East	BRP PFRA	LNID
Assessed Irrigable Acres as per Annual Reports (5-year Average 1960-1964)	736411	190867	104777	94600*	90654
No. of Water Users 1964	5815	1168	769	520	786
No. of Trustees or Advisory Committee Members 1964	55	5	7	7	3
No. of Miles of Canal as per Consultation		1306	841	484	600
No. of Turnouts		2640	1691	1304	1171
No. of Watermaster or Equivalents	24	6	3	2	5
No. of Ditchriders or Equivalents	95	28	17	13	13
Water User Factor -					
Assessed Irrigable Acreage		163	136	182	115
Elected Representative Factors -					
Assessed Irrigable Acreage		38173	14968	13514	30218
No. of Water Users		234	110	74	262
Watermaster Factors -					
Assessed Irrigable Acreage -		31811	34926	47300	18131
No. of Miles of Canal		218	280	242	125
No. of Turnouts		440	564	652	234
Ditchrider Factors -					
Assessed Irrigable Acreage		6817	6163	7277	6973
No. of Miles of Canal		47	49	37	46
No. of Turnouts		94	99	100	90

* Figures obtained from Annual Returns Report to Director of Water Resources.
** Not Comparable.

TOTALS
WEIGHTED AVERAGES FOR SELECTED
(E.I.D., S.M.R.D. East, B.R.P.,

Assessed Irrigable Acres -	536414
% of TOTAL -	73%
No. of Water Users -	3764
% of TOTAL -	65%
No. of Trustees	28
% of TOTAL -	51%
No. of Ditchriders -	79
% of TOTAL -	83%

OF IRRIGATION ADMINISTRATIONS

SMRD West	WID	TID	UID	BRD	RID	MID	AID	LID	MVID
78754	44117	34860	33997	20656*	20349*	7884*	6673*	4503*	3720*
678	707	350	179	174*	207*	125*	58*	65*	29*
4	5	3	3	3	3	3	3*	3*	3*
244	1270	197	173*	181*	22*	96*	-	47*	-
356	-	497	-	595	-	140	-	-	-
4	1	1	0	1	1	1	-	-	0
2	9	5	3	3	0	0	-	1	1
116	62	100	190	119	98	63	115	69	128
19689	8823	11620	11332	6885	6783	2628	2224	1501	1240
170	141	117	60	58	69	42	19	22	10
19689	44117	34860	-	20656	20349	7884	-	-	-
**	1270	197	-	181	22	96	-	-	-
**	-	497	-	595	-	140	-	-	-
**	4902	6972	11332	6885	**	-	-	4503*	3720
**	141	39	58	60	**	-	-	-	-
**	-	99	-	198	**	-	-	-	-

FOR
IRRIGATION ADMINISTRATIONS [a]
L.N.I.D., T.I.D., B.R.D.)

No. of Miles of Canal - 3609

No. of Turnouts - 7898

No. of Watermasters - 18
% of TOTAL - 75%

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[a] These figures were prepared for Table III, Page 43.

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